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ALIEN PROPERTY CUSTODIAN

INSULATED ELECTRICAL CONDUCTOR

Oswaldus Anthonius Jacobus van Lin, Johannes Hoekstra, and Joseph Eugene Hubert Rieter, Venlo, Holland; vested in the Alien Property Custodian

Application filed January 3, 1940

Our invention relates to insulated electrical conductors.

As is well known, cotton thread or yarn is extensively used for insulating electrical conductors. Although natural and artificial silk and acetylated cotton thread are also used and have better electrical properties than cotton insulation, such materials are so expensive that their use is restricted.

The main object of our invention is to provide an inexpensive insulating material of good electrical properties, and for this purpose we use artificial fibers obtained from casein by extrusion. Artificial fibrous material produced from casein originating from skimmed milk is particularly suitable for carrying out the invention.

In order that the invention may be clearly understood and readily carried into effect, we shall describe the same in more detail with reference to the accompanying drawing, in which the single figure is a sectionized perspective view on an enlarged scale of an insulated wire.

The wire shown in the drawing has a core 1 of conductive material such as copper, which is surrounded with a layer 2 of artificial fibrous material which has been obtained from casein by extrusion.

The insulating layer 2 may be formed by winding around the core 1, bundles of continuous elementary threads which have been produced by spinning a suitable casein solution (extruding into a coagulating bath). In another embodiment the core may be wound with yarn spun from elementary threads which have been cut to staple fibre. In the case of the uncut bundles the ele-

mentary threads may be either twisted or not. However, we prefer to use the twisted threads as this allows the material to be worked more satisfactorily on the standard covering machines.

The advantages of the insulation according to the invention will appear from the following example: A copper conductor having a diameter of 0.7 mms. was wound twice and in opposite directions with a bundle of uncut casein textile which weighed about 24 mgs. per meter, so that there was about 300 mgs. of insulation on one meter of the finished wire. The wire was then allowed to remain for about 2 days in a room in which the air was given a relative humidity of about 85%. When one meter of this wire was immersed in mercury it was found to have an insulation resistance of about 5 megohms. In comparison with this it was found that a similar wire covered in the same manner with an equal amount by weight of cotton yarn had an insulation resistance of only about 0.05 megohms.

From the above it appears that the insulation of the invention has a higher insulation resistance than cotton and as it is relatively inexpensive it is suitable for all applications in which cotton has been used.

Although we have described our invention in connection with specific examples and applications, we do not wish to be limited thereto because obvious modifications will appear to one skilled in the art.

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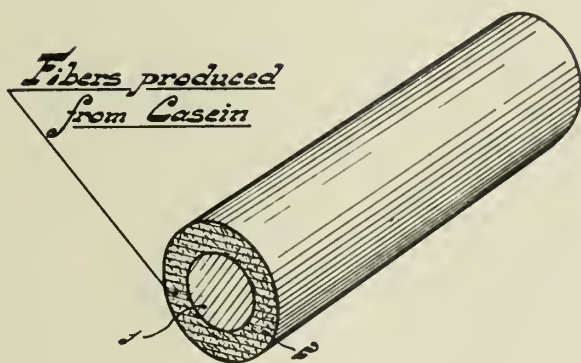
BY A. P. C.

O. A. J. VAN LIN ET AL  
INSULATED ELECTRICAL CONDUCTOR

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# ALIEN PROPERTY CUSTODIAN

## CARRIER FREQUENCY SYSTEMS

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Alien Property Custodian

Application filed January 6, 1940

This invention relates to carrier frequency systems, and more particularly to circuit arrangements for testing the operability of carrier frequency apparatus.

Each terminal equipment of carrier frequency systems comprises a number of conversational links, each of which includes a number of thermionic valves serving different purposes. It is frequently desirable to provide possibilities for testing such terminal equipment in a possibly simple manner with respect to its operability and to effect such test without necessitating cooperation with terminal equipment at the remote end of a carrier telephone line.

It is the object of this invention to provide simple means for internally testing the terminal station of a carrier frequency line. This is accomplished according to the main feature of this invention by artificially unbalancing the electric symmetry of the four-pole termination in order to provide a superposing frequency which is then utilized for testing the operative condition of each and every thermionic valve stage forming part of a terminal station.

My invention will be more readily understood from the following description taken in conjunction with the accompanying drawing, the single figure of which diagrammatically shows one embodiment of this invention.

The circuit arrangement shown in this drawing operates in the following manner. Low frequency signals resulting from a conversational connection incoming over the subscriber's line L1 pass through the four-pole terminal G, which is cooperatively connected to a balancing network N, and the low-pass filter F1 to a modulator M, where these signals serve to modulate a carrier frequency emanating from a carrier frequency generator G. The resulting two sidebands are then amplified in an amplifier V2 but the following filter F2 only passes the lower of these sidebands for further transmission to the outgoing subscriber line L2.

Conversational calls incoming from the line L2 at the frequency of the upper sideband are impressed upon a filter F3, which is designed to pass this sideband to a demodulator D, in which it is demodulated by means of the same carrier frequency from the generator G. After demodulation the resulting low frequency message currents are amplified in a low frequency amplifier V2 and then applied to the outgoing line L1 through the four-pole terminal G. Ringing signals occurring at the output circuit of amplifier V2 as a mixture of voice frequency and a ringing frequency of 20 cycles per second operate a signal-responsive device K which is caused to transmit the 20 cycles ringing current to the subscriber's line L1.

When it is desirable to test this terminal station, the operator actuates a particular switch (not shown). The contact s1 of this switch unbalances the symmetry of the four-pole terminal G, e. g. by establishing a short-circuit across the wires of the line L1, while the filter F2 is short-circuited with respect to one sideband by a contact s2, so that the second sideband is allowed directly to pass from the amplifier V1 of the transmitting branch to the filter F3 of the receiving branch. Since the low frequency blocking action of the four-pole terminal is upset, the whole carrier frequency transmitting branch is caused to oscillate at two frequencies, that is at the low frequency incoming through the filters F1 and F4 and at the frequency of the one sideband incoming through filter F3 as a result of the modulation of the carrier frequency with the low frequency in the modulator M. The sideband frequency is again demodulated in the device D.

This oscillating or singing condition of the receiving branch ceases when the generator G is rendered ineffective, since the filter F3 does not pass low frequency oscillations. On the other hand, this singing condition will be interrupted as soon as any failure occurs in the overall circuit, e. g. in response to a break-down of any element, such as the thermionic valves of the amplifiers V1 and V2. It is thus obvious that the oscillating or singing condition means that the system is fully operable, while a silent condition indicates that some fault has brought the system out of order. The singing frequency causes the signal-responsive device to respond and to actuate a relay E which reverts its contact e, thus connecting a resistor W2 to the negative pole —A of an anode voltage source, so as to cause a current flow through the resistors W1 and W2. The front contact s3 of the aforementioned switch is open during the testing procedure. The current from the anode voltage source is of such magnitude that the potential drop across the resistor W1 is sufficient to so reduce the anode voltage of the various thermionic valves that the oscillating or singing condition ceases, with the result that the relay E releases, whereupon the oscillating or singing condition recommences. It is thus obvious that the signal-responsive device K acts as a self-interrupter for the overall circuit and that this device is concurrently tested with respect to its readiness of operation together with the other members of the system. It is also possible to employ this signal-responsive device as a self-interrupter for partial circuits or even as an independent self-interrupter.

The heterodyning frequency may also be indicated on a direct reading instrument.

WOLFGANG HAGEN.



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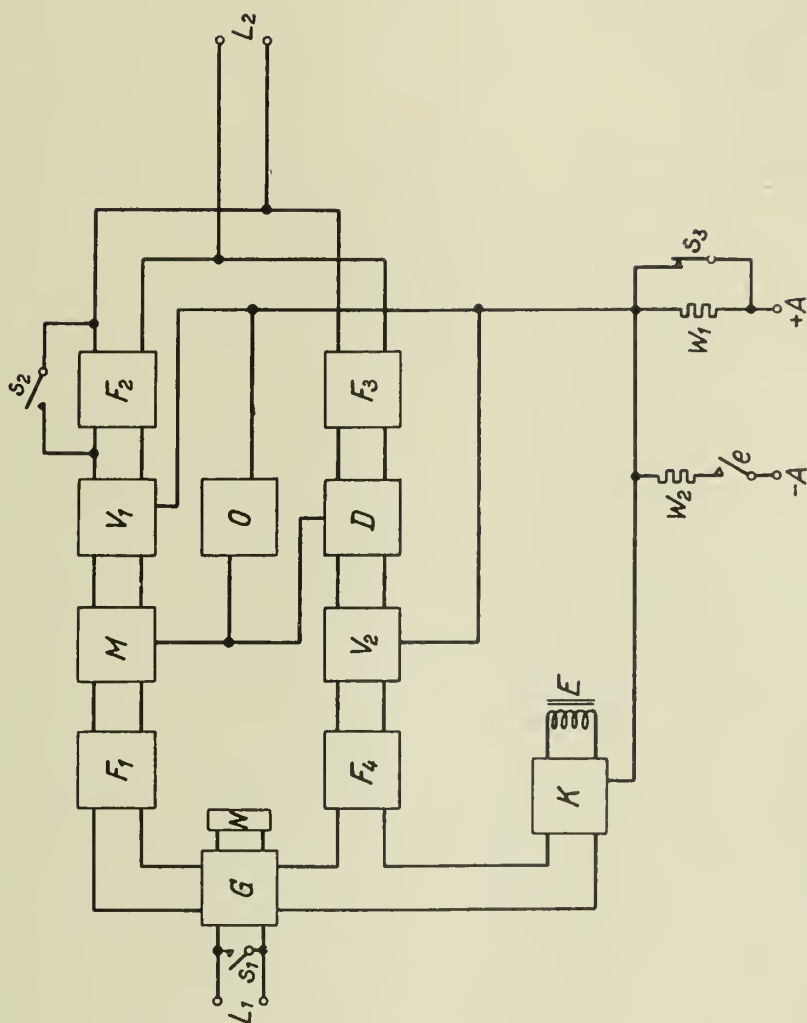
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CARRIER FREQUENCY SYSTEMS

Filed Jan. 6, 1940

Serial No.

312,644



Inventor:  
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ALIEN PROPERTY CUSTODIAN

USE OF IRON-CHROMIUM ALLOYS

Hermann Fahlenbrach, Essen-Steele, and Hans-Heinz Meyer, Essen, Germany; vested in the Alien Property Custodian

No Drawing. Application filed January 8, 1940

The invention relates to parts of magnetic apparatus, particularly for high-frequency applications, such parts being made of an iron alloy containing over 10% and up to 40% of chromium. As a matter of fact, it has been found that these alloys exhibit not only the high degree of permeability required in the case of magnetic materials in general, but also low eddy current losses, a property specially desirable in magnetic materials for high-frequency purposes. These alloys further possess the advantage of low hysteresis losses and low coercive forces and are thus also suitable for applications calling for these properties. Further practically important characteristics of these alloys are their good constancy of permeability and their easy workability, which permits the production of thin sheets and strip.

In addition to iron and chromium, the alloys used according to the present invention may also contain silicon or aluminum, singly or jointly, up to an aggregate content of 10%, for the purpose of increasing their electric resistance and improving their magnetic properties. The usual impurities may also be present. The carbon content is best kept below 0.3%, and the manganese content below 2%.

Of such alloys, those containing

	Per cent
Carbon.....	Less than 0.15
Silicon.....	Less than 1.00
Manganese.....	Less than 1.50
Chromium.....	15-35
Aluminum.....	3- 7
Balance iron and impurities,	

have proved to be particularly advantageous.

Thus, for instance, an alloy containing 21% chromium and 4.7% aluminum, the balance consisting of iron and impurities, exhibits a specific electric resistance of about 1.4Ω mm<sup>2</sup>/m and an initial permeability of 1300, while an alloy containing 30.1% chromium and 5.2% aluminum, with the balance consisting of iron and impurities, exhibits a specific electric resistance of about 1.4Ω mm<sup>2</sup>/m and an initial permeability of 1100. These permeability values remained constant, within a margin of 20%, in magnetic fields up to 300 milli-oersted. The alloys mentioned as examples were annealed at about 900° C. in a neutral furnace atmosphere, when it was shown that an increase in annealing temperature results in an increase in permeability and a slight decrease in constancy, whereas a decrease in annealing temperature furnishes the converse result.

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HANS HEINZ MEYER.



# ALIEN PROPERTY CUSTODIAN

## PROCESSES AND APPARATUSES FOR THE REGENERATION OF A LIQUID OR OTHER APPLICATIONS

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in the Alien Property Custodian

Application filed January 10, 1940

The invention has for its object to perform the manufacture of synthetic gasoline from salt water by means of effluvia or emanations produced through a development of electrostatic energy.

The invention extends to a process for producing synthetic gasoline according to which one mixes under pressure worn oil, finely divided graphite and alcohol; this mixture is submitted to an electrolytic action; this mixture is submitted to the effluvia of quicksilver lamps, which permits to obtain a homogeneous and stable colloidal solution; said colloidal solution is mixed with a salt water mass; the mixture is submitted to the effluvia of quicksilver lamps.

The invention also extends to the various apparatuses necessary for performing this process.

These apparatuses comprise the characteristics which result from the following description and especially from the claims appended at the end of said description.

Installations for the working up of these processes are represented, by way of example, on the enclosed drawing on which:

Fig. 1 is a schematic sectional view of an installation in accordance with the invention for the manufacture of synthetic gasoline.

Fig. 2 is a schematic cross section of another installation, in accordance with the invention, for the manufacture of synthetic gasoline.

Figs. 3 and 4 are respectively a front view and a sectional axial view of a lamp.

Fig. 5 is a longitudinal sectional view of an apparatus used in the installation of Fig. 2.

Fig. 6 is a longitudinal cross section of an installation for the preparation of a colloidal solution.

Fig. 1 shows an installation for the manufacture of synthetic gasoline from salt water:

Sail salt water gets to 26, traverses a distributor 27, then comes to a constant level vat 28.

A colloidal preparation is contained in a conical receiver 29 forming mixer and combined to a filter-preparer 30. The salt water traverses said preparation then flows, after crossing an isolating part 30; into a receiver 31, containing lamps 11 analogous to those below described. These lamps are set in rotation through a motor 32.

At the outlet of receiver 31, the liquid passes through a tube 33, surrounded by a coil 34 which is traversed by an electric current.

The liquid then flows through another isolating part 35, then goes a conical receiver 36, forming a mixer and containing a colloidal preparation different from the first one, and combined to a filter 37.

At last, the liquid runs to a decantation vat 38. The gasoline comes out through 39 and is collected at 40; the residue water is drained at 41.

To prepare the two colloidal solutions utilized above, the installation represented on the Fig. 6 can be used to advantage.

Said solution comprises a preparation vat 42 containing two electrodes 43<sub>1</sub>, 43<sub>2</sub>; and the pressure of which is indicated on a manometer 44. Said vat is separated from an exhaust muffler 47 having baffles 47<sub>1</sub>, 47<sub>2</sub> by a safety plate 45 having a gasket 46. The preparation vat is heated by a resistance 53; it communicates with an expansion vat 50 having a lid 51 and a valve 52, through the medium of a pipe on which two valves 48<sub>1</sub>, 48<sub>2</sub> and two apparatuses 49<sub>1</sub>, 49<sub>2</sub> with lamps 11 . . . are intercalated.

This installation operates as follows:

In the preparation vat 42, mineral oil is introduced, worn oil, for instance, or oil coming from the draining of engines. A graphite of well determined origin, very finely sifted and having a carbon contents of at least 99% is added to it. At last, a certain proportion of alcohol variable according to the proportion of alcohol to be obtained in the fuel is added. The quantity of alcohol to be added is higher, by 10% at least, than the quantity of alcohol required in the final product.

The above mixture is performed under a certain pressure. The electrodes 43<sub>1</sub>, 43<sub>2</sub> are then put under a tension of 110 or 220 volts. At the end of about 10 hours, the mixing of the products introduced in the vat 42 is intimately secured.

By opening the valves 48<sub>1</sub>, 48<sub>2</sub> and under the action of the pressure in the vat 42, the mixture is sent into the expansion vat 50, passing in the lamp apparatuses 49<sub>1</sub>, 49<sub>2</sub>. Under the action of said lamps, the colloidal mixture is fixed, i. e. made stable. It is no longer to be feared that after a certain time has elapsed, the graphite will deposit at the bottom of the receiver by gravity, not that the oil and alcohol will separate due to their difference in densities.

The vat 50 which is used for storing the stabilized colloidal preparation may also serve to incorporate the mixture to soft charcoal used as support.

In case of explosion in the preparation vat 42, the safety plate 45 will tear off and the gaseous products issued from the explosion will expand by turning round the baffles 47<sub>1</sub>, 47<sub>2</sub> of the exhaust 47.

The Fig. 2 represents another installation for the manufacture of synthetic gasoline which

makes use, as that of Fig. 1, the colloidal solutions obtained with the apparatus of Fig. 6.

In the installation of Fig. 3, a compressor 60 discharges air, through a pipe 61, into a cylindrical receiver 42 containing the colloidal preparation.

Said colloidal preparation, under pressure, is sent through a pipe 63 into a mixer constituted by a glass capacity 64, through the medium of a nozzle 65 controlled by a cock 66.

The glass capacity admits, on the other hand, through an inlet 67, the salt water driven by a distributor 27. Said distributor 27 admits the salt water through a pipe 26 and discharges it into a constant level vat 28 connected to the glass capacity 64.

In said capacity, the salt water mixes with the injected colloidal preparation. The mixture formed leaves the capacity through the tube 68 and, is introduced into a receiver 31 containing the quicksilver lamps 1 set in rotation through a motor 32.

At the outlet of the receiver 31, the liquid passes in a tube 33 surrounded by a coil 34 which is traversed by an electric current.

The liquid then crosses an isolating part 35, then arrives to an inclined tubular receiver 36 containing the quicksilver lamps 37 of circular shape, and driven in a movement of rotation over themselves by a motor 91.

The liquid having flowed across said receiver 36 is decanted in a vat 38. The gasoline produced is collected at the surface through the pipe 39 and evacuated through the pipe 40. The residual water is drained through the pipe 41.

Quicksilver lamps used in the installation of Figure 2 are shown on the Figures 3 and 4.

The lamp 1 assumes the shape of a torus mounted on a frame 15, which is, itself, mounted on a rotation axle 16.

The stationary capacity 5 surrounds completely the lamp 1, which shows, on the other hand, baffles or rugosities 17<sup>1</sup>.

The quicksilver 4 tends to accumulate constantly at the lowest point and flows along the inside walls of the lamp 1. When said lamp 1 rotates, the baffles 17<sup>1</sup> drive the quicksilver 4, then let it fall again. This motion creates a tension inside the lamp; there results an electric field which is influenced by the quicksilver in the stationary capacity 5.

It is an advantage to introduce in the lamp 1 or in the capacity 4 a rare gas (neon, krypton, etc.) under small pressure. An increase in the electrostatic effect is thus obtained.

The electrical energy developed makes itself visibly known through luminous phenomena. The colour of these lights depends on the pressure inside the isolating body and on the nature of the filling gas. It is an advantage to consider a pressure from 4 to 10 m/m of quicksilver.

Radioactive emanations may also be added to the atmosphere of the lamp 1, in order to still further the formation of effluvia.

The tubular receiver 36, containing the quicksilver lamps 37 used in the installation of Figure 2 is represented on the Fig. 6 and comprises a frame 75, two feet of which 75<sup>1</sup> 75<sup>2</sup> support two inclined and parallel cheeks 76<sup>1</sup> 76<sup>2</sup>. Between said two cheeks 76<sup>1</sup> 76<sup>2</sup> a cylinder 77 is pressed. An inlet chamber 78 with issuing pipe 79 and impurities exhaust tube 80, is mounted on the lower cheek 76<sup>1</sup>. An outlet chamber 81 with outlet pipe 82 and impurities exhaust tube 83 is mounted on the upper cheek 76. Each exhaust tube is stopped by a removable plug 84—85. The whole of the inlet chambers 78 and outlet chambers 81 and the cylinder 77 is pressed on the cheeks 76<sup>1</sup> 76<sup>2</sup> by ties 86.

The cylinder 77 communicates with the inlet chamber 78 and outlet chambers 81 through openings 87<sup>1</sup> 87<sup>2</sup> provided in the cheeks 76<sup>1</sup> 76<sup>2</sup>. Said cheeks constitute bearings for an axial shaft 88 mounted on ball bearings 89<sup>1</sup> 89<sup>2</sup>. Said shaft carries quicksilver tubes of circular shape 37<sup>1</sup> 37<sup>2</sup> 37<sup>n</sup>. A motor 91 mounted on the upper cheek 76<sup>2</sup> drives the shaft 88 through the medium of a gear transmission 92—93 also serving as speed reducer.

The operation of said apparatus is as follows: the liquids are coming through the pipe 79, passes in the chamber 78 where they undergoes a first decantation, the impurities being evacuated through the tube 80. They are traversing the openings 87<sup>1</sup> passes in the cylinder 77 where are submitted to the successive action of the quicksilver lamps 90<sup>1</sup> 90<sup>2</sup>, and they comes out through the openings 87<sup>2</sup> and passes in the outlet chamber 81 where they deposits impurities which are exhausted through the tube 83.

ALBERT GASTON SAHEURS.

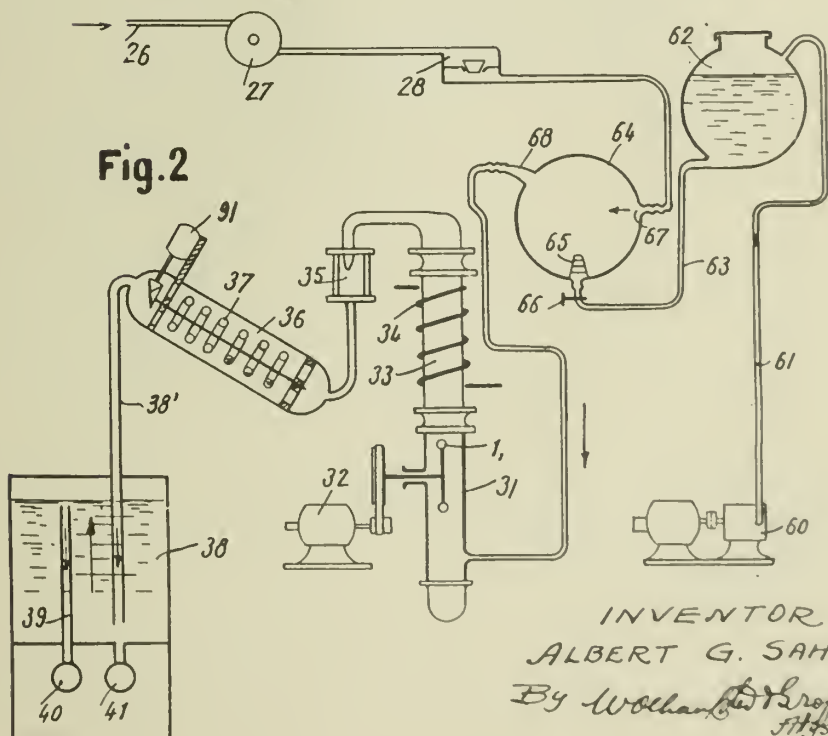
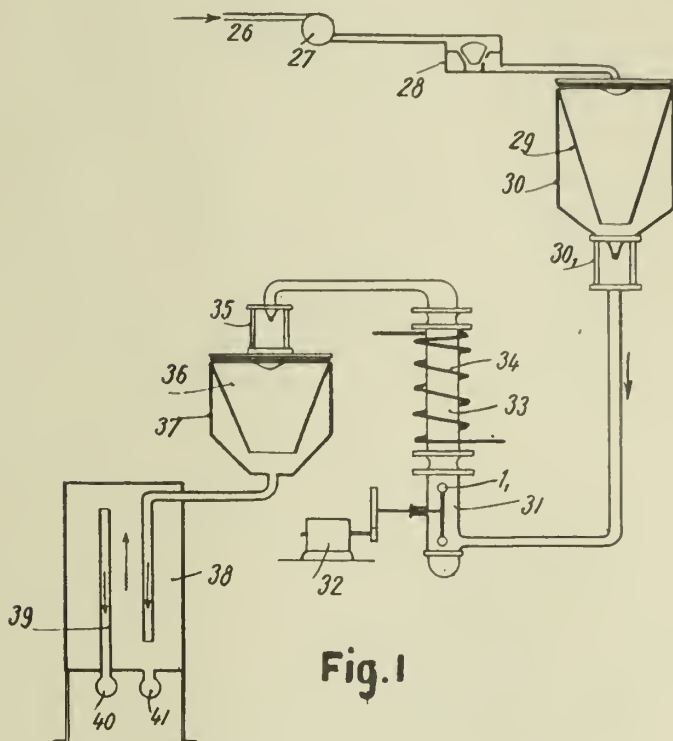
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BY A. P. C.

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Fig. 3

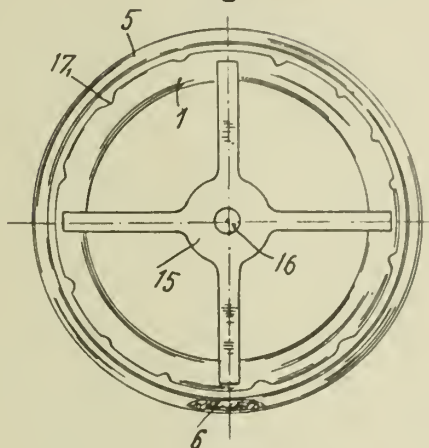


Fig. 4

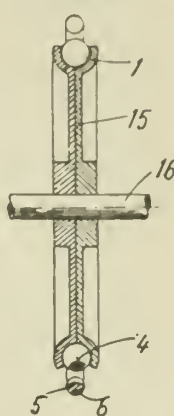
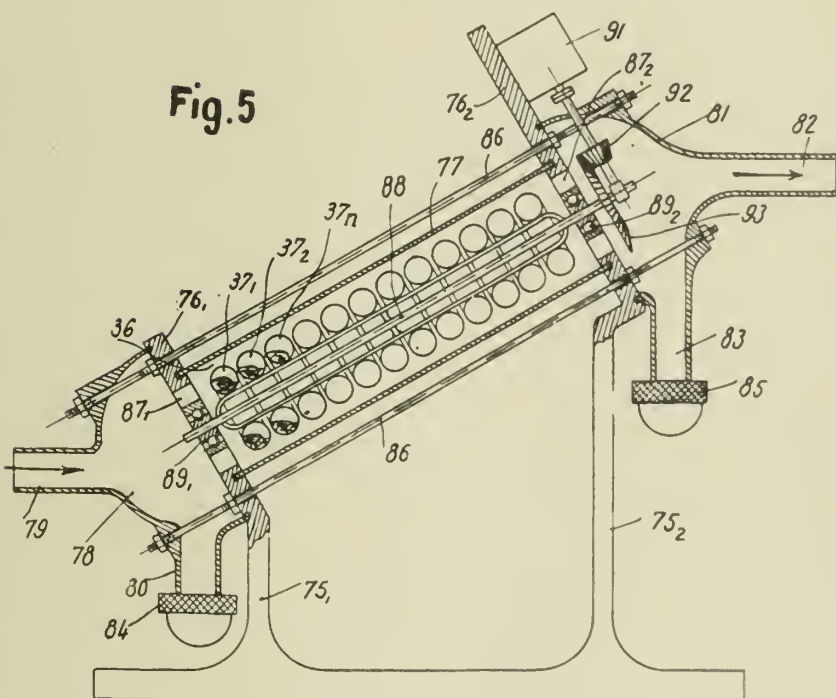


Fig. 5



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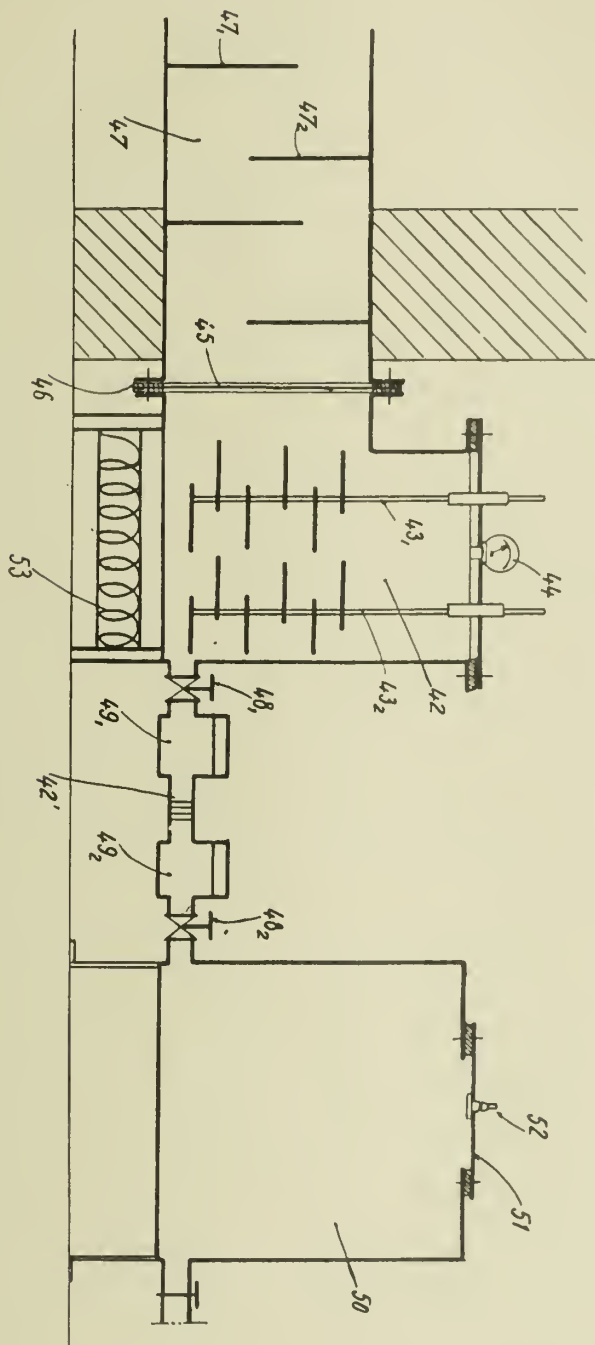


Fig. 6

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# ALIEN PROPERTY CUSTODIAN

## PADDLE-WHEEL WITH MOVABLE PADDLES

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Application filed January 15, 1940

The efficiency of an organ of propulsion is substantially affected by the density of the medium in which it works. The greater the density or mass of the medium the better the efficiency under otherwise equal conditions. For this reason the efficiency of ship propellers partly immersed is inferior up to 50% to the efficiency of the completely submerged propeller. This considerable deterioration of the efficiency is due to the entrance of air into the accelerated water. The same applies to paddle-wheels which dip only partly into the water and whose paddles pass alternately through air and water.

After recognizing that the reduced efficiency, particularly at high push, was due to the entrance of air attempts were made to eliminate this defect by the use of wheel paddles which, measured in radial direction, are very narrow, for the great height of paddle of about 0.85 m with a normal immersion of 1.00 to 1.10 m, used so far, was considered to be the cause of the entrance of the air. The narrow paddles were controlled in such a manner that they were idle as they entered the water; their operation only commenced after the upper edge of the paddles was about 40 cm under water, i. e., after the water layer above the paddles was strong enough to resist the pressure of the air. The paddles were then guided through the water in a substantially vertical position without any atmospheric air now being able to enter the field of operation. On rising from the water the paddles were once more caused to be idle.

The expectation that the use of narrow paddles and the consequent elimination of the entrance of air would lead to a general improvement of the paddle drive was, however, not fulfilled. Actually, only a slight improvement was ascertained. Detailed investigations revealed that with the introduction of a layer of a thickness of about 40% of the depth of immersion of the paddle-wheel for keeping off the air the accelerated mass of water amounted to only about 60% of the water mass within the action of the wheel. The push of the wheel, however, is directly proportional to the volume of the mass.

The present invention aims at the acceleration of the whole mass of water within the action of the wheel in such a way that the paddles, whose depth is less than 55% of the depth of immersion of the wheel, from their way from the lower dead centre till leaving the water are at an angle of small incidence or attack which does not permit any interruption in the water at the back of the paddles. It would be best for the paddles to have a section like the segment of a circle.

The subject matter of the invention is illustrated by the accompanying drawing.

Fig. 1 is a semi-diagrammatic view of the paddle-wheel showing the directions of flow and the ratio of forces.

Fig. 2 is a sectional view of part of the wheel on the line X—X in Fig. 1.

Fig. 3 is a sectional view of the shape of one of the wheel paddles.

The paddles 1 revolve around shaft 2 on the circle of movement 3. They are controlled or guided by brackets 4, eccentric rods 5, and eccentric 6 attached to the ship and driven by the wheel. The paddles are movably attached to wheel arms 7 held together by ring 8; arms 7 are connected with shaft 2 by naves 9. In order to prevent an axial movement of the arms inclined struts 10 are provided. The wheel turns round shaft 2 with the circumferential speed  $u$  and is moved through the water with the speed  $ve$ . Extent and direction of these two speeds are marked in Fig. 1 in case of the rising paddle; both result in the speed of the flow  $vo$  whose direction sets upon the paddle at so narrow an angle of incidence or attack that the water-stream at the back of the paddles is not interrupted. This stream results in a power of resistance  $W$  and a forward driving force  $A$ , vertical to it, in the direction of travel. Owing to the little depth of the paddles the latter are wholly submerged almost until rising completely out of the water so that the front edge is always washed by the water. In Fig. 1 the approximate position of paddles 11 in the water in case of a wheel of usual construction is indicated by hatching. It appears that the upper edge is only a short time under water and that in case of normal push a complete entrance of air is unavoidable.

The use of rod 12 indicated in Fig. 1 and Fig. 2 or the use of similar members of construction behind a narrow paddle will completely destroy the improved efficiency of the new wheel because these members will allow air to pass to the under-pressure sphere behind the paddles; accordingly, interfering parts must be avoided in case of narrow paddles.

In order to prevent the priming of air at the entrance the paddle must be provided with a bevelled rear edge. However, the same bevelling is also required on the other edge, that is, on the edge that is to the rear when the paddles leave the water, in order to attain an effective carrying or supporting surface effect. Experiments have shown that the best efficiency is attained with paddles of a section like the segment of a circle as shown in Fig. 3.

The wheel according to the invention differs from the known wheels with narrow paddles in so far as the whole mass of water within the action of the wheel is accelerated by a certain position of the paddles on the way of the paddle from the lowest position till leaving the water and by the shape of the paddles.

FRANZ AUGUST SÜBERKRÜB.



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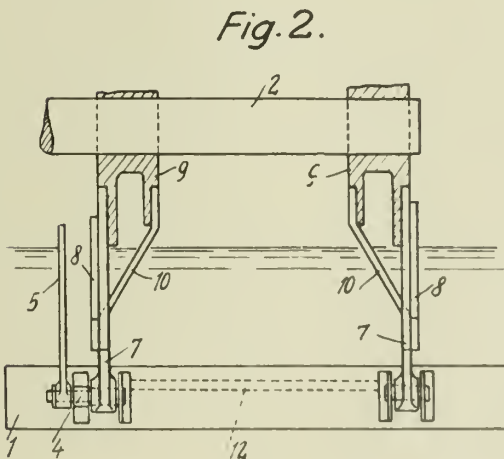
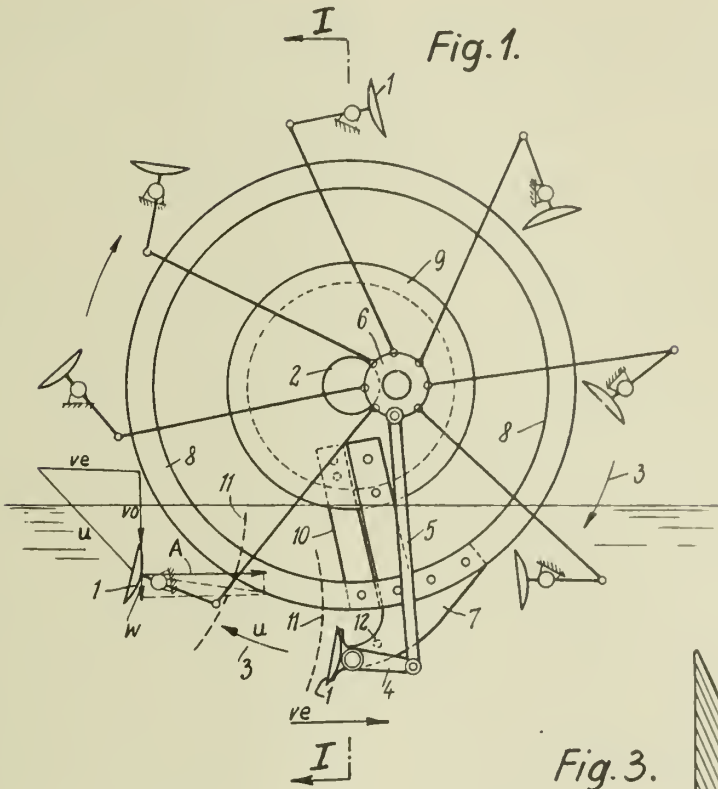
F. A. SUBERKRÜB

PADDLE-WHEEL WITH MOVABLE PADDLES

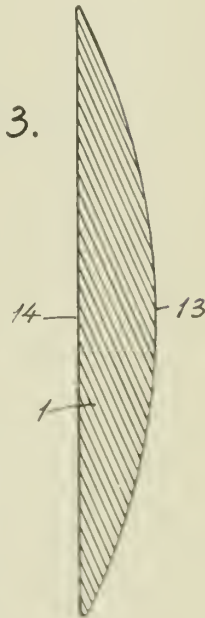
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Serial No.

313,982



*Fig. 3.*



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# ALIEN PROPERTY CUSTODIAN

## ELECTROMAGNETIC MULTIPLE-DISC CLUTCH

Anton Ryba, Bolzano, Italy; vested in the Alien Property Custodian

Application filed January 16, 1940

The present invention relates to an electromagnetic multiple disc clutch as used essentially in motor vehicles for effecting change of gear.

Clutches of this kind must be of simple construction and yet of high specific efficiency.

The object of the present invention, which is a continuation in part of my copending U. S. Application Ser. No. 176,339, filed November 24, 1937 for "Electromagnetic multiple-disc clutch", is to provide a multiple disc clutch fulfilling to a high degree both of the above mentioned conditions.

To this end I propose to arrange in combination: a pair of clutch members, an electromagnet provided at one of said clutch members, a set of ferromagnetic friction discs in front of one of the two pole surfaces of said electromagnet, a sleeve of ferromagnetic material for guiding the magnetic flux, said sleeve having a tothing or notching respectively for receiving a set of said friction discs and the armature having a tothing or notching fitting the tothing or notching respectively of the above mentioned sleeve, and means for conducting the magnetic flux principally in axial direction through the packet of discs, as: a ring of non-magnetic material connected to the ferromagnetic sleeve, having a common tothing or notching respectively for receiving a set of said friction discs, extension of one set of discs beyond the pole surface into the zone of the exciting coil, advantageously provided in this zone with a row of perforations or recesses forming air gaps for the purpose of improving the magnetic insulation.

Clutches of this kind are of particular simple construction and yet have the advantage of easily carrying off the heat from the friction discs, so that such clutches are free of heat stresses and warpings.

In the accompanying drawings a clutch according to the invention is shown by way of example.

In the drawings:

Fig. 1 is a longitudinal section through a clutch with the discs in front of the outer pole surface,

Fig. 2 is a front-view of the clutch of Fig. 1.

Fig. 3 is a longitudinal section through a clutch with the discs in front of the inner pole surface,

Fig. 4 is a longitudinal section through a clutch with one set of discs extending into the zone of the exciting coil,

Fig. 5 is an elevation of an inner disc having perforations, belonging to Fig. 4,

Fig. 6 is an elevation of an inner disc provided with elongated teeth, belonging to Fig. 4,

Fig. 7 is an elevation of an outer disc, belonging to Fig. 4.

Rotatably mounted upon a shaft 3 (Fig. 1) is a gear wheel 2 upon which an annular electromagnet 1 is fixed, in the annular space of which an exciting coil 4 is located. The terminals of the exciting coil 4 are connected to mass on the one hand and to a slip-ring 5 on the other hand, which under insertion of an insulating layer 6 is pressed upon the electromagnet 1. Also fixed upon the latter is a ring 7 having claws 7a into which engage the outer discs 8. Mounted upon the shaft 3 is a sleeve 9 consisting of ferromagnetic material and secured against rotation, to said sleeve being rigidly connected a non-magnetisable ring 10 for the purpose of effecting a magnetic insulation, said ring 10 at its outer circumference having a common tothing or notching respectively with the ferromagnetic portion of the sleeve 9, into which engage the inner discs 11 and the armature 12 by means of a suitable tothing or notching respectively. For the purpose of obtaining the desired effect such tothing or notching must be so constructed that surface contact occurs between the flanks of the teeth of the armature and those of the sleeve, so that passage of the magnetic flux may be effected without air gaps (Fig. 2).

In Fig. 3, upon the shaft 3 is fixed an annular electromagnet 1, the outer pole 1a of which is extended and carries a non-magnetisable ring 10 and a ferromagnetic ring 14, both of them secured to it. Said rings 10 and 14 at their inner circumference have a common tothing or notching, in which engage the outer discs 16 and the armature 12. The non-magnetisable ring 10 (also in Fig. 1) has nearly the breadth of the packet of discs when compressed. The gear wheel 2 is rotatably mounted upon the shaft 3 and possesses a toothed boss in which engage the inner discs 15.

Fig. 4 differs from Fig. 1 in that the inner discs 11 extend into the zone of the exciting coil, advantageously having in this zone a row of perforations 11a or recesses 11b for the purpose of improving the magnetic insulation. To the shaft 3 the ferromagnetic sleeve 9 is rigidly connected, having at its outer circumference a common tothing or notching, in which engage the inner discs 11 and the armature 12. The armature 12 at its inner circumference has a tothing or notching, fitting to the sleeve 9 in such a manner, that surface contact occurs between the

flanks of the teeth of the armature and those of the sleeve, in order to reduce the magnetic resistance of the flux passage between the armature and the sleeve as far as possible.

Discs similar to those of Figs. 5 and 6 are also applicable in constructions corresponding to Fig. 3. Then it is not necessary to use rings such as 16 and 14, but the extended pole 1a of the electromagnet 1 is provided with a tothing or notching, in which engage the outer discs which (like 16 in Fig. 3) extend into the zone of the exciting coil, as well as the armature 12, which in this case has a tothing on its outer circumference. In the discs may also be provided, in the zone of the exciting coil, perforations or recesses (as in Figs. 5 and 6).

The discs not extending into the zone of the exciting coil, are in all constructions normal narrow rings of plate, provided in a known manner with carriers for connecting them to one clutch

member. Fig. 7 shows for example such a disc 8 as employed in Figs. 1 and 4.

Instead of consisting of one piece, the armature 12 may consist of individual discs.

The operation of the above described clutch is as follows:

If the circuit is closed, a magnetic field is produced in the sense of the dash line, which owing to the magnetic insulation through the non-magnetic ring 10, or through the air gaps in the zone of the exciting coil, traverses the set of discs mainly in an axial direction and passes between the armature and the sleeve mainly in a tangential direction on the flanks of the teeth, either on the one or on the other side according to the contact of the flanks at that moment. An iron closed path of the flux may be obtained, in spite of an easy axial displacement of the armature, by this arrangement.

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PUBLISHED

MAY 18, 1943.

BY A. P. C.

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ELECTROMAGNETIC MULTIPLE-DISC CLUTCH

Filed Jan. 16, 1940

Serial No.

314,170

2 Sheets-Sheet 1

Fig. 1

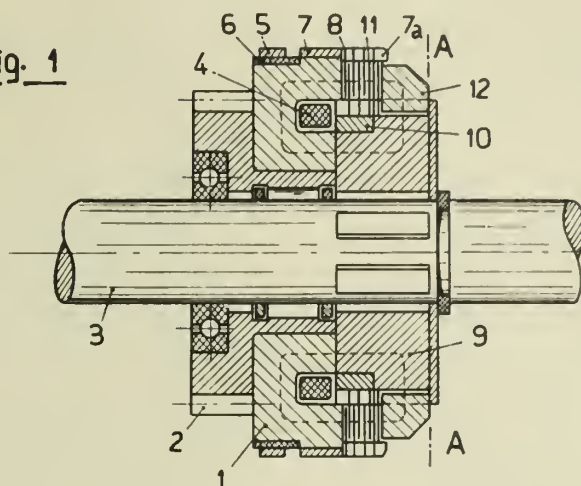


Fig. 2

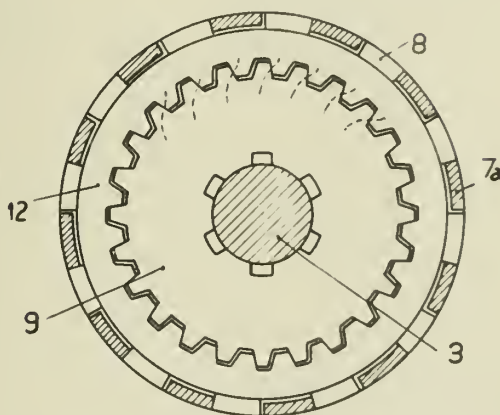
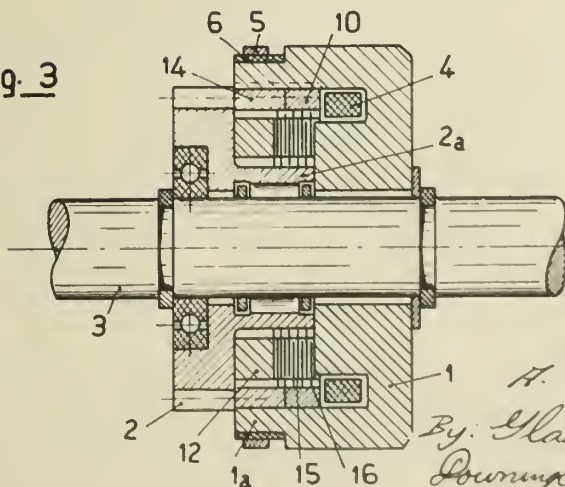


Fig. 3



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MAY 18, 1943.

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Serial No.

314,170

2 Sheets-Sheet 2

Fig. 4

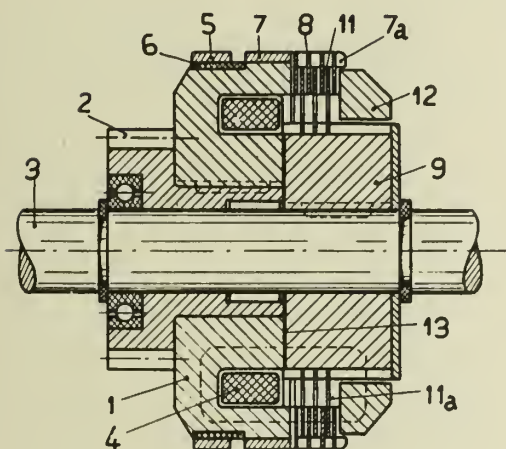


Fig. 5

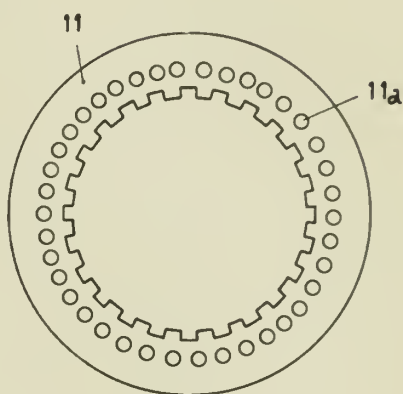


Fig. 6

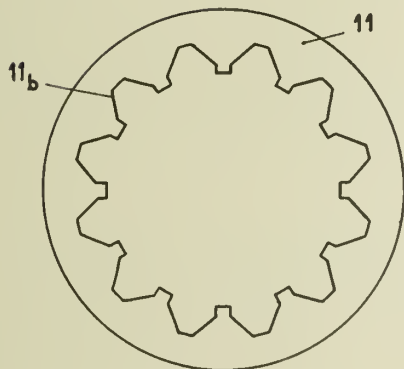
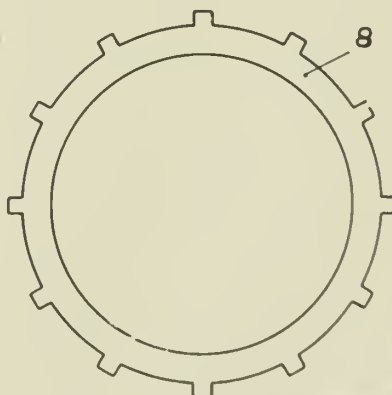


Fig. 7



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ALIEN PROPERTY CUSTODIAN

LUMINESCENT LAMP WITH TURBULENT DISCHARGE

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Application filed January 22, 1940

This invention relates to gaseous discharge tubes which are capable of becoming luminescent.

The purpose of the invention is to provide tubes of such nature, which are shorter in length, and consequently more suitable for use in lighting installations than those which heretofore have been made.

In the past, it has been the practice to make luminescent gaseous discharge tubes as long as possible relative to their diameters, in order that the tubes possess suitable power factor characteristics. However, tubes of such elongated form are not well suited for use in many lighting installations because of their cumbersome shape.

The objective of the present inventor, briefly, has been to provide tubes of shorter length than those which have been made heretofore, but in which the voltage drop in the positive column is of the same, or substantially the same, value as that in a tube of much greater length, filled with the same kind of gas, at the same pressure.

The present invention is principled upon the employment of a magnetic field which is normal to the electric field producing the discharge. The magnetic field serves to increase the length of the path through which the ionic discharge is caused to flow, and as a result, the potential gradient in the tube is increased independently of the length of the tube.

The drawings illustrate typical embodiments of the invention employing this principle. In the drawings:

Figure 1 is a diagrammatic view of a tube having a magnetic field centrally of its axis, and normal, or lateral to the path of the electric discharge.

Figure 2 is a diagrammatic view illustrating a typical modification of the arrangement shown in Figure 1.

The lamp of Figure 1 is of the tubular variety and it comprises an outer transparent envelope 1 having a closed end 2, and an inner tube 3 one of whose ends is closed, 4. The open ends of these tubes are joined as at 5, to form a gas chamber indicated generally at 6.

The chamber 6 contains an electrode 7 at the one end encircling the inner tube member 3, and another electrode 8, at the other end. The chamber is filled with gas of a suitable kind, as understood by those skilled in the art, and at a suitable

pressure, so that a gaseous discharge is produced when the tube is energized.

For the purpose of producing a magnetic field for increasing the path of the ionic discharge in the gas chamber, a magnetic core 9 is installed within the inner tube 3. This core is energized, or magnetically excited, by a coil 10; the magnetic excitation serves to produce a field indicated generally by the spiral dotted line 11.

The ionic discharge flowing along the spiral path indicated by the dotted line is turbulent and greatly elongated, while the length of the tube from one end to the other is relatively short.

Another feature of the invention resides in the employment of a choke as heretofore connected in series with the tube. When this arrangement is employed, an increase in the intensity of the magnetic field causes an increase in the elongation of the positive column; as a result, for the same power factor, the value of the choke is or may be diminished. Furthermore, when the choke is in series with the field, it serves to control the negative resistance of the tube.

A further feature of the invention resides in the use of the magnetic field for the purpose of intensifying the electric and ionic friction of the discharge of luminescent substances within the tube, for the purpose of increasing their luminosity. Accordingly, in Figure 2, an outer tube 12, having a lining 13 of a suitable fluorescent or phosphorescent substance on its interior surface, is employed in conjunction with an inner tube 14 containing the choke assembly 15 for producing the magnetic field. The magnetic field is placed within the tube relative to the luminescent lining so as to increase the friction of the discharge of the fluorescent or phosphorescent material. The greater electronic friction imposed upon the luminescent body intensifies the illumination from it.

In the device shown in Figure 2 the outer tube 12 is equipped with a plug 16, and the choke is connected, as shown, within the body of the lamp, the electrodes being illustrated as in Figure 1.

It will be understood by those skilled in the art that other means may be employed for the production of the magnetic field in place of the particular arrangements disclosed.

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PUBLISHED

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Serial No.

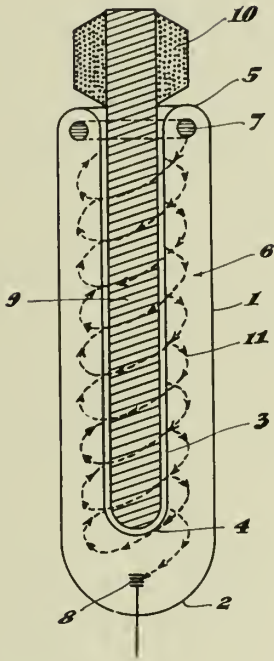
MAY 18, 1943.

LUMINESCENT LAMP WITH TURBULENT DISCHARGE

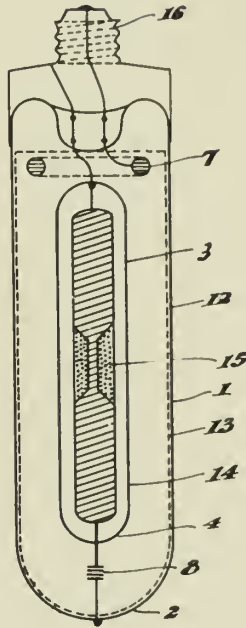
315,017

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Filed Jan. 22, 1940



*Fig. 1*



*Fig. 2*

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# ALIEN PROPERTY CUSTODIAN

## PROCESSES AND APPARATUS FOR SEPARATING LOOSE MASSES

Cornelis Schouten, Delft, Netherlands; vested in the Alien Property Custodian

Application filed January 24, 1940

The invention relates to improvements in a process and apparatus for the separation of solid particles from loose masses, particularly ore-bearing materials, for example, alluvial, eluvial or crushed primary ores, according to their specific gravity and grain size, such apparatus being of the kind known as "shaking tables" in which a loose mass in a wet state is subjected to a reciprocatory or agitating movement over an impervious bed or bottom. In one well-known form of apparatus, the material is fed over an impervious, usually riffled, table subjected to a reciprocatory and differential movement and washed by a film of water flowing at right angles to the direction of motion. The major part of the material treated is discharged at one of the longitudinal ends of the table, the material being sorted by the movement of the table—in the direction of the longitudinal axis—in consequence of the difference in specific gravity and grain size of the particles.

Separation in channel or launder systems, in so-called rheo-laveurs sluices, long toms, etc., is in certain respects similar to this process, but presents in actual practice a fundamental distinction in that it operates with a rapidly flowing stream of water without reciprocatory or agitating movement. A comparatively solid bed is formed on the bottom of the channel or launder within which no further effective separation takes place, so that a clean separation of unclassified or unsized material practically cannot be obtained to an efficient extent.

The operation of jigs is based upon a reciprocating motion of the granular mass supported on a screen by upward impulses of water currents at regularly recurrent intervals. The tailings and the specifically heavy concentrate may in some cases both be discharged principally in the horizontal direction (gate and dam-discharge); in general, however, the major portion of the mass is principally discharged in the horizontal direction, while the concentrate is drawn off in the vertical direction through the screen. However, the concentrate always travels to the point of discharge under the action of a current of water pulsating through a perforated plate or screen. The jig is useful for dealing with coarse grained material but is less suitable for handling fine grained material because the capacity is then considerably reduced and the upwardly directed currents of water may easily cause very fine particles of high specific gravity to enter the specifically lighter mass which is discharged.

The shaking table affords very great advantages in the separation of fine material, namely an effective separation and easier recovery of fines than in a jig. However, the table also presents disadvantages. The capacity per unit of surface area (or per square metre) is very low. Previous classification in hydraulic classifying apparatus or spitzkasten is desirable in order to obtain good results. Relatively coarse material is difficult to treat on a shaking table. The upper layers of the mass must be discharged in the direction in which the mass travels over the table on which the separation takes place, owing to the agitating and in some cases differential movement in order that the concentrate may be retained. Due partly to the differential movement of the table and partly to the action of the cross wash of water, separation takes place in a lateral direction along the path of travel. However, the concentrate must traverse the entire length of the table in order that it may be withdrawn. The danger then arises of the specifically heavy constituents being washed out of the relatively thin bed. Shaping of the surface of the table, such as the provision of riffles, has not always been found sufficient to prevent this. Consequently, losses of concentrate occur, particularly of extremely fine material in the riffled, but also of relatively coarse materials in the unriffled-part of the table-deck.

The invention overcomes these disadvantages by combining to a certain extent a shaking table with a jig. Accordingly, the present invention comprises a process for the separation of solid particles according to their specific gravity and grain size, of the kind in which a loose mass of material in a wet state travels over an impervious surface or bed in a substantially horizontal or slightly inclined direction while being subjected to a reciprocatory or shaking and differential motion wherein the general direction of transport of the main mass of solid material is substantially the same as the direction of travel for discharge of the heavier particles or concentrate, and wherein heavier particles or concentrates passing downwards in the mass are discharged at one or more intermediate points in the path of the loose material over said surface or bed through openings which are subjected from below to a hydraulic, if desired, pulsating counter-pressure. Preferably, the mass of material (comprising the particles of less specific gravity) and the concentrate are discharged at different levels, it thus being possible for the bed

to be much thicker than in the case of known types of shaking tables.

The process according to the invention to a certain extent thus combines the advantages of the jig and of the shaking table, and has the object of eliminating the disadvantages of these apparatus as far as possible. It permits of recovering relatively coarse to relatively very fine particles of high specific gravity such as of gold, platinum, cassiterite and the like with very small losses. This highly selective extraction is accompanied by a large capacity and considerable concentration, while the water consumption is very low.

By the term "concentrate" as used herein is meant the enriched specifically-heavy constituents, regardless of whether they are valuable, valueless or even harmful.

A constructional form of the apparatus according to the invention is shown with various details in the accompanying drawings, in which:

Figure 1 shows the apparatus in longitudinal section,

Figure 2 is a plan view,

Figure 3 is a sectional view of a discharge arrangement with corresponding stand pipe,

Figure 4 is a modified constructional form of the point of discharge, and

Figures 5 and 6 show a somewhat modified constructional example of a discharge arrangement in section corresponding to Figure 1 and in plan view respectively.

Referring to Figure 1 of the drawings, the numeral 1 designates a substantially trough-shaped container having an impervious bottom interrupted only by one or more points of discharge intermediate its length. This container is rectangular in plan view, as is shown in Figure 2. The mass to be dressed is fed by means of a hopper 2 and withdrawn at the discharge end. The trough is suspended by a series of pivoted links 4, 5 mounted on shafts 6 and 7 respectively and may consequently be rocked to and fro, for example by means of an eccentric 3 coupled with an eccentric rod 9 engaging at a point of rotation 10. A differential movement or a percussive action may sometimes be applied. Due to the suspension of the trough on links 4, 5, the movement also has a vertical component which may be regulated by correct selection of the inclination and of the length of the links 4, 5. The links may be of different lengths in order that the movement imparted to the container may not be completely parallel and are preferably so arranged (i. e. of a length which decreases in the series from the feed to the discharge end) that the vertical component of movement increases from the feed to the discharge end of the trough. The links may be adjustable in length.

Owing to the reciprocating motion, the mass is moved through the trough from the delivery end to the discharge end. The surface of the bed of material is somewhat irregular and will generally follow the course of the bottom. The surface will generally follow the line II—II. The mass is preferably provided with an ample amount of water, but not with so much that the washing takes place as in rheo-laveurs sluices or long toms.

The reciprocating motion of the container causes the specifically heavy constituents of small grain size to pass downwards through the coarser mass, so that these constituents are concentrated at the bottom of the container. Various measures may be applied to assist this separation,

while care must be taken at the same time that the mass remains sufficiently loose or "alive". To this end, a wall 12 and different groups of pins 13 are provided. The said wall has a direct influence on the mass delivered, on which it exerts a damming effect in the direction of the bottom of the container. It may at the same time serve to prevent any splashing action of the water. The pins 13 are inclined in the direction of the bottom of the container and in the general conveying direction. They could naturally also be arranged on the bottom of the container itself and could be replaced by walls or similar members.

The bottom of the container extends downwards in the direction in which the mass is conveyed to the points of discharge, as at 15 and 16. The descent is somewhat gradual and the concentration is particularly great at these points. The bottom parts 15, 16 are preferably provided with transverse strips or riffles, for example in the form of steps, in order that the concentrate formed may not have any tendency to return or to mix with the remaining mass under the action of the reciprocating movement. At the same time, the steps assist the forward movement of the material in the lower layers in the direction of the points of discharge.

In this way, a somewhat large quantity of concentrate, which also contains the finest grain parts and is greatly enriched, may be discharged from the relatively thick bed of large conveying capacity at the end of the bottom parts 15, 16, for which purpose the discharge points 20, 21 are provided, which are fashioned in the manner of slots extending transversely through the apparatus. Immediately behind the points of discharge 20, 21 the bottom of the container again extends upwards, either somewhat vertically or at an incline. It is obvious that concentrates of different composition and different structure may in some cases be discharged at the different points of discharge.

The form of the points of discharge may vary per se. Generally, the discharge apertures 20, 21 will be partly closed by obturating members which leave certain small, if necessary gap-like apertures permitting of the passage substantially solely of the particles of the desired grain size of the material intended to be extracted. According to Figure 1, sharp-edged sheets or plates 22 and 23 are provided in the lateral edges of which narrow gaps are left for the passage of the specifically heavy constituents. These sheets 22, 23 could be combined with or replaced by gratings or perforated plates and if desired a shot—or mineral—bottom bed or the like could be provided thereon.

The water which flows from the apparatus with the specifically heavy constituents through the discharge points 20, 21 may be regulated in any desired manner. Thus, it may be desirable to oppose the hydrostatic pressure inside the container by a counter hydrostatic pressure. This may be achieved by suspending the entire container in a water bath. If, in this case, the water bath is fixed (which, however is not necessary) a pulsating water movement through the discharges 20, 21 will at the same time be produced owing to the movements of the container, which is very favourable to the constant loosening of the bed and of the discharge chambers and discharge points.

Moreover, stand pipes may be provided at the points of discharge as is shown in Figure 3. A

vertical channel 25 tapering in the manner of a hopper or spigot may then be provided for example, below the plate or sheet 22, this channel being connected to a tubular rubber member 26 adapted to follow the movements of the container 1. On the other hand, the tubular rubber member 26 is fitted over the fixed element 27, which is provided with an upwardly extending stand pipe 28 attached laterally thereto. A tube 29 having an overflow 30 and a water supply 31 is telescopically arranged thereon. The height to which the tube 29 is adjusted determines the height of the water column, the pressure of which acts on the point of discharge 20. The particles of the ore passing the sheet 22 may be finally withdrawn through the branch pipe 32. If desired, a pressure water pipe could also be made to open into such an apparatus for the purpose of periodically or continuously washing through the discharge points.

A further constructional form of a discharge point is shown in Figure 4. The slot is here covered by a curved sheet 40, in the front side of which a gap 41 is left, through which the concentrate below a certain grain size may leave the container 1. Here again, a sheet 22 having gaps in its longitudinal edges is provided. This sheet co-operates with a perforated plate 42. Arranged on the sheet 22 are one or more series of balls 43 which are themselves in constant movement

owing to the movement imparted to the container. The shocks thus exerted on the sheet 40 have a favourable effect on the discharge.

The sheets 22 may be replaced by corrugated sheets 25 as shown in Figure 5, apertures here again being left in the longitudinal side. For this purpose, recesses 46, 47 are in this case provided only in the troughs of the corrugations. The crests of the corrugations are not recesses but extend through to the lateral edges of the discharge branches. The corrugated form of the sheet 45 affords the advantage that a certain separation is effected on this sheet 45, since the specifically heavy constituents collect in the troughs, so that discharge is effected only therefrom. Here again, balls may be loosely arranged above or below the sheet 45, which exert an impulsive action.

The discharge points may be provided at different positions of the closed bottom of the container 1. Thus, the first discharge could in Figure 1 also be arranged at the point 50. The number of discharge points depends upon the circumstances, in accordance with which one or more are provided.

The width of the container has no effect on the efficiency of the separation, but only affects the capacity of the apparatus.

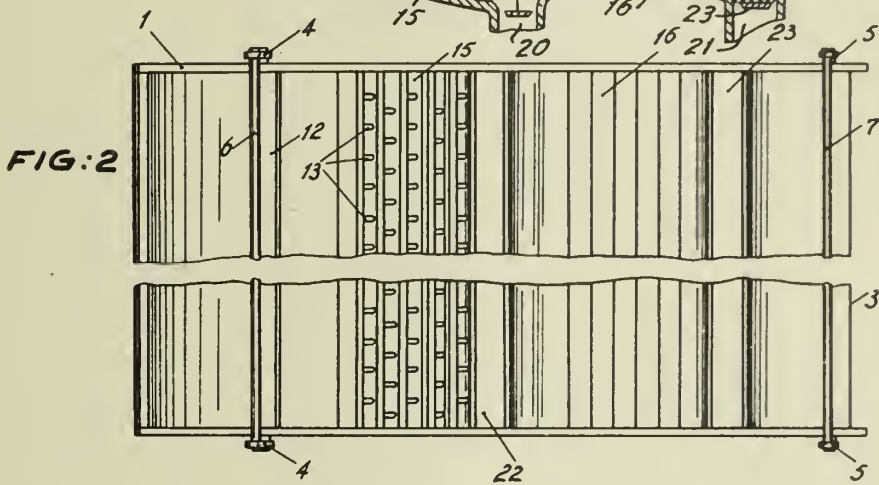
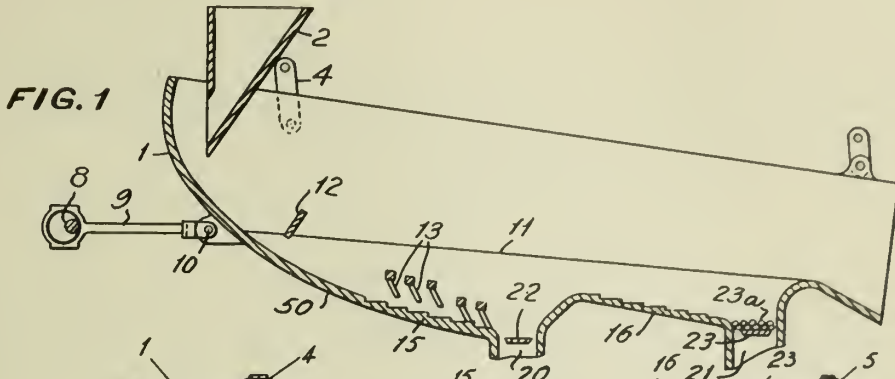
CORNELIS SCHOUTEN.



PUBLISHED  
MAY 18, 1943.  
BY A. P. C.

C. SCHOUTEN  
PROCESSES AND APPARATUS FOR SEPARATING  
LOOSE MASSES  
Filed Jan. 24, 1940

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315,426





# ALIEN PROPERTY CUSTODIAN

## METHOD OF REDUCING HYSTERESIS INACCURACY

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No Drawing. Application filed January 25, 1940

The object of the invention is to increase considerably the accuracy of indication of moving iron measuring instruments, which, at present, amounts to .4% to 1% of the scale end value for D. C. and A. C. The dynamometer, as is well known, is the only type of measuring instrument which could be built so far with great accuracy for D. C. and A. C. However, its usefulness, as is known, is greatly decreased, among other things, by the comparatively large throughput required, by difficulties with the elimination of the inaccuracies due to temperature, and the current supply to the movable spool. The moving iron instrument, as a current measuring instrument with one range, is free from this disadvantage. It is, therefore, a technical improvement if, because of the actions of this invention, a moving iron instrument can be built, which remains securely constant for D. C. as well as A. C. of standard frequencies of class O.2, and which, therefore, is to be considered a precision instrument.

Obviously, this improvement can be achieved only by reducing the influences characteristic of the moving iron type. The expert no longer has any fundamental difficulty in reducing, among these known influences, the influence of alternation by reducing the amount of metal employed in building the instruments, the influence from external fields by suitable shielding or astacitization, the friction influence by increasing the mechanical efficiency to the measure necessary for this class. There remains, as source for inaccuracy of the present moving iron instruments, the error accompanying calibration and measuring with D. C., and caused by the hysteresis in the iron cores. It is clearly symbolized by the differential  $\Delta i$  of the readings with increasing and decreasing D. C.; so, in per cent of the scale and value  $i_{\max}$ , this D. C. or hysteresis inaccuracy is:

$$(1) \quad f = 100 \frac{\Delta i}{i_{\max}}$$

Aside from the understandable rule, that sheet of lowest coercive force and remanence is to be used, there are up to now no quantitative technical rules from which the actions by which the inaccuracy  $f$  is being brought to a level as low as possible or as desired, can be clearly understood. Investigations aimed at this now have produced the result

$$(2) \quad f = 1257 \cdot \frac{1}{N} \cdot \frac{b}{B_{\max}}$$

for the relation between the error  $f$ , the geometrical formation of the cores or of the core, and the magnetic qualities of the core material.  $f$  is in this the inaccuracy defined in (1), in percent and  $N$  the demagnetization factor. Besides,  $B_{\max}$  (in Gauss) is the greatest induction excited by the highest current  $i_{\max}$ ; to this induction value is clearly associated a magnetization loop, the breadth of which is marked with  $b$  (in Oersted). Accordingly, the core material is to be so selected that

$$\frac{b}{B_{\max}}$$

becomes as small as possible in order to keep the hysteresis inaccuracy down. This rule does not correspond to the procedure heretofore known (namely) to select a core material with the lowest possible coercive power; the coercive power in Permalloy for instance is C 0.035 Oe., in Mumetall 0.034 Oe, 50% nickeliron 0.046 Oe, accordingly 50% nickeliron would be as core material the least suitable of them. The various materials, however, differ in the degrees of the induction at which the magnetic saturation is reached; for instance, the saturation induction of the three materials named, is, in the same order 8,000 Gs, 7,500 Gs, 14,000 Gs, and it is found that

$$b/B_{\max} = 0.87 \dots 0.91 \dots 0.66 \cdot 10^{-5} \text{ Oe/Gs}$$

50%, nickel iron, therefore, is according to (2) the most suitable core material of the ones mentioned. Of course, only a certain percentage of the saturation maximum induction will be permitted to occur in  $i_{\max}$  for various technical reasons; for instance in view of the harmonic vibration content of the current. According to (2) therefore it depends upon the breadth  $b$  of the magnetization loop in this induction value  $B_{\max}$ . For instance with about 40% of the actual saturation induction is found in round figures in the order of the three alloys named above

$$b/B_{\max} = 2.1 \dots 1.8 \dots 1.3 \cdot 10^{-5} \text{ Oe/Gs}$$

So, the alloy 50% nickeliron, in spite of its larger coercive power, is the most advantageous, because it has the smallest ratio  $b/B_{\max}$ .

The dimensions of the core or of the cores, up to now, have been primarily established with a view to the scale run and the turning moment produced. It is new and surprising that in the formula (2) the core dimensions are represented by the demagnetization factor. The demagnetization factor  $N$  is determined in sufficient

approximation only by the core dimensions. According to the invention, therefore, the dimensions of the core or cores are to be so formulated, in order to reduce the hysteresis inaccuracy to a minimum, that the demagnetization factor becomes large. The rule, to make  $N$  as large as possible is independent of the characteristic style of construction of the moving iron instrument; however, it shows that it is very advantageous to use two cores which repel each other, since it seems that with the presence of two cores the demagnetization is larger than with only one. The development of the two repelling cores as strip cores in a moving iron instrument of the round spool type results, as is known, also in the advantage of a better scale division.

Examples: If the hysteresis inaccuracy in a moving iron instrument is to be brought down to not more than 1 Promille:  $f=0.1$ , so that it can be called a precision instrument, the demagnetization factor  $N$ , in the three alloys Permalloy C, Mumetall, 50%—nickel iron must be according to (2) at least 0.27 .. 0.23 .. 0.165 and the core dimensions are to be established accordingly. We know that the larger the required demagnetization factor, the more com-

pact will be the form. The required demagnetization factor for example with a given thickness of the cores or the core is reached by change of the rest of the dimensions, for instance that of the length, or by a geometrically similar change of the rest of the dimensions while keeping the form, or by change of the thickness in case the rest of the dimensions are fixed. If, for instance  $f=0.1$  is permissible, but the lowest possible weight of the turning system is required, one cannot, in order not to make the core breadth too large, increase  $N$  above a certain size; then it follows from the figures stated, that material is to be chosen whose value  $b/B_{\max}$  is the smallest; that is nickel iron.

For the sake of the necessary security mainly because of the magnetic variations of that material, therefore, a demagnetization factor of at least  $N=0.2$  is necessary for moving iron instruments, which are not to show an error of more than 1 Promille. After what has been stated, such moving iron precision measuring instruments will be developed preferably with two strip cores which repel each other and will be of the round spool type.

HEINRICH TOELLER.

ALIEN PROPERTY CUSTODIAN

ADJUSTING PITCH OF SCREWS

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vested in the Alien Property Custodian

Application filed January 30, 1940

This invention relates to mechanism for adjusting the pitch of the blades of an air or water screw propeller, whether the propeller be running or at rest, and for indicating the pitch, and provides also for automatically adjusting the blades to a predetermined position.

More particularly the invention relates to mechanism for this purpose including a differential gear having one sun wheel rotating with the propeller driving shaft and another normally rotating with the propeller but capable of adjustment with respect to it by movement of the planet pinion carrier of the differential gear, such adjustment of the sun wheel relatively to the propeller being utilised to vary the pitch of the propeller blades.

It is a principal feature of the present invention that the differential gear of the pitch adjusting mechanism is arranged not upon the propeller shaft but upon a lay shaft, its first sun wheel being driven from the propeller driving shaft, and its second sun wheel operating the pitch adjusting gear through a reverse gear. By this arrangement it is possible to reduce the tooth speeds of the gear wheels, and to construct the mechanism compactly so that it may be included in the housing of the engine by which the propeller is driven. The arrangement has also the advantages of permitting convenient installation of a pitch indicator, and of automatic pitch-adjusting means, as well as enabling adjustment of the blade pitch of two oppositely rotating propellers.

Examples of construction of the invention are shown diagrammatically in the accompanying drawings.

Figure 1 shows a propeller mounted on the engine shaft, with the differential gear of the pitch adjusting mechanism upon a lay shaft.

Figure 2 shows the propeller on a lay shaft and the differential gear upon the engine shaft.

Figure 3 shows the propeller on a lay shaft and the differential gear on another lay shaft.

Figure 4 shows a detail of the pitch-adjusting mechanism for removable propellers.

Figure 5 shows the invention applied to a pair of oppositely running propellers.

In Figures 1 to 3 a gear wheel 3 keyed upon the engine shaft meshes with a gear wheel 4 by which the differential gear is driven. The differential gear shown is of the bevel pinion type, comprising sun wheels 5 and 7 with both of which mesh one or more planet pinions 6. This differential gear is upon a lay shaft 2, the sun wheel 5 and gear wheel 4 being keyed on a sleeve 8 surrounding-

ing the shaft 2, while the sun wheel 7 and a wheel 9 are keyed on another sleeve 10; the planet pinion carrier is fast on the shaft 2, and in addition to carrying a radial spindle for the planet pinion, or each of the planet pinions, has gear teeth 11 upon its periphery. In Figures 1 and 3 the teeth 11 are spur teeth and mesh with a pinion 12 upon a control shaft 13 which may be turned by hand or power to rotate the planet carrier and the shaft 2. In Figure 2 the teeth upon the planet carrier are worm teeth, and the carrier is turned by a worm shaft 13'.

The blades 19 are mounted to rotate in the hub of the propeller, and are interconnected by gearing so that they all turn simultaneously and to the same extent. In Figures 1 and 3 the pitch-adjusting gearing is shown as comprising a ring of worm teeth upon the root of each blade, with which engages a worm shaft mounted in the propeller hub and carrying at its end a pinion 18; all the pinions 18 mesh with the same pitch-controlling gear wheel 17. In Figs. 1 and 2 this pitch control gear wheel is keyed on a sleeve on the propeller shaft 1, and on the same sleeve is keyed a wheel 14 driven from the wheel 9.

Since the wheel 9 rotates in the opposite direction to the gear wheel 4, while the wheel 14 is required to rotate normally in the same direction as the gear wheel 3, an idle pinion or other means of reversing the direction of motion must be included in the drive between 9 and 14 so that these two may rotate in the same direction. In Figures 1 and 3 these wheels are shown as sprockets connected by a chain 15.

The pitch adjusting mechanism works as follows. So long as the control spindle 13 is left at rest the planet carrier does not turn, and the planet wheels 6 turn only on their axis. The gear ratio of 3 and 4 being the same as that of 14 and 9, the wheel 14 turns in the same direction and at the same speed as the wheel 3, that is at the speed of the screw propeller. Hence the pinions 18 have a planet motion only and do not turn on their axes, and the pitch of the blades is fixed. When, by turning the control 13, the planet pinion carrier is rotated in the one direction or the other the sun wheel 7 is turned relatively to the sun wheel 5 in the same direction as the planet carrier and through twice the angle; and the wheel 14 is similarly turned relatively to the wheel 3. Whether the engine and propeller are running or not makes no difference. Thus all the pinions 18 and all the blades 19 are turned by the same amount corresponding to the extent of turning of the control handle.

In the construction of Figure 3 the pitch-control wheel 17 and the pinions 18 are placed on the forward side of the propeller. The propeller shaft 1 is driven by gearing from the engine crank shaft, and in turn drives through the gear 3, 4 a differential gear placed on another lay shaft 2. This makes it possible to reduce the overall length of engine, screw propeller, and pitch-adjusting mechanism and makes for compactness. The propeller can be brought close up to the engine, and the tooth speeds in the pitch-adjusting mechanism can be reduced.

The shaft 2 of the differential gear upon which the planet pinion carrier is keyed, carries also a worm 20 by which the motion of the planet pinion carrier is imparted through the worm wheel 21 to an indicator pointer 22 moving over a scale 23. By this means an indication of the pitch angle of the blades is constantly given.

In Figure 1 the control spindle 13 is shown as rotatable by hand by means of a crank handle. Alternatively it may be turned by power as indicated in Figure 3 where a motor 24 drives the spindle. When a motor is employed the indicator 22, 23 may be modified to bring about automatic adjustment of the blades to a predetermined pitch angle. For this purpose a pre-selecting switch lever 25 is provided which can be set in any desired position along the scale 23, being retained where set by a spring pawl engaging notches 26 in the edge of the scale. The switch lever carries a tilting switch 27 which controls the motor 24, the motor being set in motion in one direction or the other according as the switch is moved to one or other of its extreme positions, and the motor circuit being broken when the switch is in its mid position. Upon the pointer 22 is an abutment 28 in position to engage and operate the tilting switch 27. When the pointer 22 is aligned with the switch lever 25, as is the case for the position of the switch lever shown dotted in Figure 3, the switch 27 is in its mid position and the motor 24 is at rest. If the switch lever is moved in one direction or the other to pre-select a different pitch setting for the blades 19, the abutment 28 throws over the switch 27 and starts the motor 24; it starts the motor in the direction needed to cause the pointer 22 to follow the switch lever. The motor continues running until the pointer 22 is aligned with the switch lever, the attainment of this position coinciding with the movement of switch 27 to mid position by the abutment 28.

By aid of this device any pitch angle of the blades may be pre-selected, from the extreme setting for gliding, through all possible driving settings to the opposite extreme setting for braking, and the corresponding adjustment of the blades will automatically follow. This is particularly of value for braking an air-craft by giving the blades negative pitch.

This device may also be employed as part of the control apparatus for automatically controlled propellers, for instance for propellers which are automatically maintained at a constant speed of rotation; it responds instantly to small departures from the desired conditions and prevents over regulation. For example the lever 25 may be connected with the propeller regulator so as to be moved by it, and the tilting switch 27 may be designed for any desired degree of sensitiveness of regulation.

End contacts 29 and 30 upon the scale 23 may co-operate with contacts on the pointer 22 to

bring about interruption of the circuit established by the switch 27.

Since it is commonly desirable that the blades 19 shall be removable for replacement, and also that the whole propeller shall be removable for replacement, it is necessary to ensure that a new blade or new propeller can only be mounted in the position which the indicator 22, 23 purports to show. Locking means are provided to prevent the blade or propeller being mounted in any other position than that indicated. For example, for the purpose of fine adjustment the pinions 18 upon the propeller hub may carry discs 31, partly cut away as at 32, so that the propeller can be put in position only when the cut away parts 32 register with the gear wheel 17. This, however, does not alone ensure unique correspondence between the setting of the blades 19 and the position of the wheel 17 and the indicator 22, 23. Approximate correspondence, or coarse adjustment, is therefore first secured by bringing into alignment setting marks 33, 34, upon the propeller hub and the wheel 17 respectively.

The drawings show the gears 3 and 4, 14 and 9 as having approximately a 1.1 ratio; a different ratio may be chosen when it is desired to make the tooth speeds of the planet pinions 6 specially small.

The pitch-adjusting gear wheel 17 has either to be on a sleeve 35 surrounding the propeller shaft as shown in Figures 1 and 2, or on a spindle 35' passing through the propeller shaft as shown in Figure 3.

A combination of these two arrangements adapts the pitch mechanism to the control of two co-axial oppositely rotating propellers. This is shown in Figure 5, where a single differential gear serves both propellers. Such parts of Figure 5 as clearly correspond with parts of Figures 1 to 3 are indicated by the same reference numerals; where the correspondence is not exact reference letters are employed. The propeller next the engine whose blades are indicated by 19 has its pitch-controlling gear wheel 17 on a sleeve 35 surrounding the hollow shaft 1 of the propeller. The forward propeller blades are indicated by 19' and their pitch adjusting wheel by 17', which is secured on a spindle 35' passing through the hollow propeller shaft 1'. On the engine shaft is keyed spur wheel *a* and a sleeve connects this wheel with the adjacent sun wheel *b* of the differential gear. The planet pinions 6 mesh with the sun wheel *b* and the sun wheel *c*, and the latter is on a sleeve which also bears the spur wheel *d*. The spur wheel *a* drives a spur wheel *e* keyed on the shaft 1' of the forward propeller, while the spur wheel *d* drives the spur wheel *f* keyed on the shaft 1 of the rear propeller. On the sleeve 35 which carries the pitch-controlling wheel 17 for the blades 19 there is also keyed a spur wheel *g*, which is interconnected with the spur wheel *a* by gear wheels *h i* keyed on the shaft *k*. On the sleeve 35' which bears the pitch controlling wheel 17' there is also keyed a sprocket wheel *l*; this is connected by a chain *m* with the sprocket wheel *n* on shaft *p*, on which is also keyed a spur wheel *o* meshing with the spur wheel *f*.

As in Figure 1 the planet pinion carrier bears a ring of spur teeth 11, meshing with a pinion on the control spindle; but the latter, as well as the indicator are not repeated here in order not to complicate the figure unnecessarily; in principle

their construction can be as already shown in Figure 3.

The teeth pressures exerted on the planet pinions 6 by the sun wheels of the differential gear tend to turn the planet pinions in the same direction about the axis of the gear. This pressure may be utilised to turn the pitch-adjusting mechanism quickly upon the disengagement of the pinion on the control spindle from the teeth 11. If the extent of rotation is suitably limited in each direction, e. g. at the position for gliding and braking, the power of the engine may be brought to bear to bring the blades rapidly to braking position as soon as the teeth 11 are disengaged; and similarly by throttling down the engine the momentum of the propellers now overrunning the engine will turn the planet pinion carrier in the opposite direction and bring the blades to

gliding position. Thus either the engine or the rotating propeller yields the considerable energy needed to adjust the blades quickly to braking or gliding position. If the engine ceases to function the blades will automatically set themselves in gliding position if the teeth 11 are disengaged from the pinion on the control spindle, so leaving one task less to the pilot of a multi engine aircraft.

It is better that the teeth 11 should remain in mesh with the pinion on the control spindle, and disengagement for the above purpose be effected by actuation of a free wheel device.

The mechanism may be so designed that the tooth pressures used to give power for adjusting act in the opposite direction to that above described.

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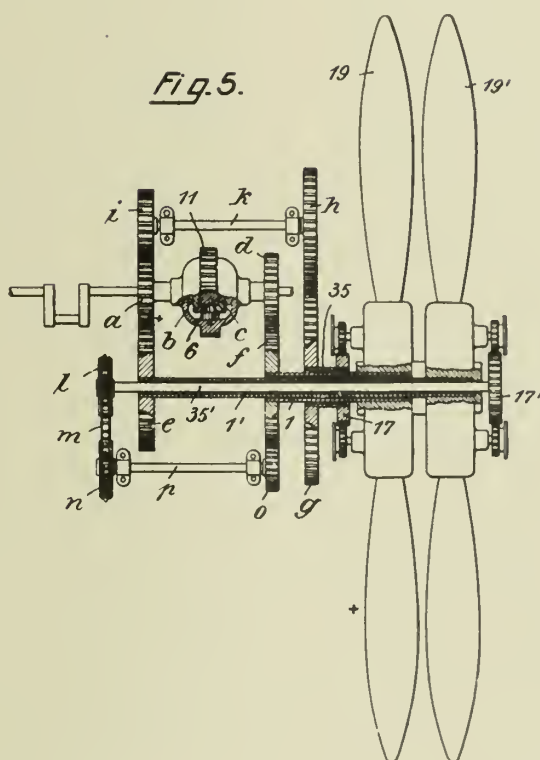
ADJUSTING PITCH OF SCREWS

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# ALIEN PROPERTY CUSTODIAN

## MICRO-CHRONOMETER, ESPECIALLY FOR MEASURING DISTANCES BY THE ECHO SOUNDING METHOD

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The invention relates to micro-chronometers, especially for measuring distances by the echo sounding method, in which the time or distance values are indicated by an indicator with a scale showing the time or distance measured.

When using a scale comprising the entire measuring range of the instrument, there is the disadvantage that the smaller values measured cannot be read with the required accuracy, although the measuring accuracy of the instrument admits of using a correspondingly accurate scale. For measuring distances by the echo sounding method in water, where the time or distance is measured by means of a uniformly revolving time giver which, on sound emission, passes through the zero point of the scale, and the displacement of which, at the moment of the arrival of the echo, serves as a measure for the distance and is indicated by the lighting up of a lamp or in some other way, it has been proposed, for avoiding the disadvantage mentioned, to let the time giver revolve with a different velocity according to the desired measuring range and to provide several scales with different measuring ranges to correspond thereto.

However, this solution is complicated and also has the disadvantage, in order to avoid wrong measurements, of requiring to make sure whether the value measured is actually contained in the smaller indicating range used, by changing to the large measuring range for a trial. Such a measuring method is especially disadvantageous when the indication changes within short intervals from one measuring range to the other, as for example in the landing altimeters for airplanes operated by the echo sounding method. Naturally, the necessary changing over of the altimeter when landing is very disturbing, because the attention of the pilot is very much occupied in landing, particularly in a fog. On the other hand, the provision of larger measuring units for small altitudes is of special importance in landing altimeters for airplanes, as the entire scale is arranged in a very small space requiring a small grading.

Echo sounding instruments are also known in which, owing to irregular motion of a mechanical time giver, a correspondingly irregular division of the scale is required. In this case, the variation of the measuring accuracy is constant over the scale and generally follows an exponential law depending upon the mechanism of the time giver.

The problem solved by the invention is to provide a chronometer of condensed construction with a clearly arranged scale, in which the meas-

uring range, that is of special interest, admits of sufficiently accurate reading, and in which changing to different measuring ranges is not required.

This problem has been solved by the invention by electrically connecting the time giver to the indicator in such a way that the indication of the time or distance on the scale is effected in several ranges with different time or distance gradings changed by jumps from one range to the other. The new instrument is particularly suitable as landing altimeter where rapid changes from larger to smaller measuring values are effected, because the reading and measuring accuracy may be increased completely automatically without requiring any special switching.

In micro-chronometers in which, for measuring the time, a voltage is used, varying in the time range to be measured, according to a certain law, and in which the measuring voltage is supplied by a rotating potentiometer or by a condenser charging and discharging itself, as time giver, the voltage time giver (rotating potentiometer or time circuit) may have a potentiometer or time circuit resistance, or a time circuit condenser, extending over the contact path and varying in its magnitude according to the time, i. e. between two soundings, or according to the space, i. e. over the angular range of the rotating potentiometer, following a law predetermined in accordance with the desired irregular division of the scale.

When using a rotating potentiometer as time giver, the irregular scale may be produced according to the invention in a particularly simple manner by a resistance extending over the contact path of the rotating potentiometer and having over the length of the resistance, corresponding to the desired irregular scale division, different resistance values per distance unit or per angular degree of the rotating potentiometer. This may be achieved in various ways, for example by using different resistance materials, by varying the cross section, or by resistance coils with different lengths of windings.

When a condenser charging and discharging itself is used as a time giver, a corresponding variation of the charging resistance or of the capacity of the time circuit, according to the time, is required so that the charging or discharging is effected with different speeds at the various moments. The variation of the time circuit resistance or of the time circuit capacity must, in this case, be effected positively by a device operating synchronously with the soundings.

An arrangement in landing altimeters for airplanes which is of special advantage with regard to the sensibility in landing may be achieved if the potentiometer or time circuit resistance varies within the time circuit period or the angular range of the potentiometer in such a way that the scale is in all parts linear and at the beginning proportional, and at the same time has a measuring accuracy changing by jumps from one section to the other. Thus, the scale will receive an irregular division, but, in contradistinction to known measuring instruments with an irregularly divided scale, the division will not be exponential but in all parts linear. Consequently, each section of the scale will show equal changes in altitude by equal changes of deflection, corresponding to the correct sensibility in landing.

When using a rotating potentiometer, such a division of the scale is particularly easy to obtain if the resistance extending over the contact path has a resistance value which is equal in all parts, whereas the irregular distribution of the resistance is produced by providing one or several additional resistances which are connected parallel to certain angular ranges of the circular potentiometer resistance.

When using a time circuit, a sectionally linear distribution of the measuring accuracy over the scale is obtained by providing the time circuit with an additional connectable and disconnectable charging resistance or condenser which, by means of a contact or a tipping circuit oscillating synchronously with the soundings, is connected or disconnected after each sound emission and is changed back upon sound emission, and by choosing a small final voltage of the time circuit condenser with respect to the voltage of the source of charging current.

In the accompanying drawings, which illustrate several constructional examples of the invention,

Fig. 1 shows a connection with gas discharge tubes serving as indicating members,

Figs. 2 and 3 show an indicating device with the indicating elements arranged in a common container, in cross section and plan view,

Fig. 4 shows a further constructional example in diagrammatic illustration,

Fig. 5 shows a device for connecting different scale divisions,

Fig. 6 shows a connection with a rotating potentiometer as time giver,

Fig. 7 shows a connection with a condenser as time giver.

The devices illustrated by way of example serve for determining the altitude of flight of the aircraft, especially when landing, and are operated by the known echo sounding method. For this purpose, the period between the emission of a sound impulse and the return of the echo from the surface of the earth is determined. The arriving echo releases an electromagnetic relay arrangement whereby an indication is produced on the scale of altitudes.

In the drawings, the place where the echo enters the apparatus, is marked E.

The relay arrangement in the first constructional example illustrated in Fig. 1 is formed by a short period relay with two alternating contacts. The two moved contact arms 1 and 2 of the relay are connected to the two poles of a source of voltage. In the resting position of the contact arms on the contacts 3 and 4, shown in the illustration, this voltage is applied to the

anodes and the cathodes of a series of gas-filled glow tubes 5 connected in parallel, arranged distributed over a straight or circular distance scale 6. On arrival of an echo, the contact arms 1 and 2 are for a short period disconnected from the contacts 3 and 4, and thereby, as will be easily seen, all tubes 5 are simultaneously disconnected from the source of voltage; the relay arm 1, connected to the positive pole, knocks against a contact 7, which is connected to the grid 10 of one of the tubes 5 via a contact arm 8, revolving with uniform velocity and serving as time giver, and via a collector 9. The contact arm 8 revolves synchronously with the succession of soundings, a sound impulse being emitted in its zero position marked O. When a sound is emitted, the contact arm or time giver 8 effects the connection to that tube 5 which is at the zero point of the scale. The grids 10 of the tubes 5 are connected to the collector 9 as well as via a condenser 11 for each grid to the negative pole of the source of voltage. On arrival of an echo, the condenser 11 of that tube is charged, which at this moment is connected via the collector 9 to the revolving time giver 8. When the contact arms 1 and 2 of the relay return to their initial position (contact with the contacts 3, 4), a voltage is again applied to the anodes and the cathodes of all tubes. This voltage is, however, so low that it will normally not cause the ignition of the tubes; merely that tube, to whose grid condenser 11 a voltage has been applied via the collector 9 and the revolving time giver 8, will now be ignited. Immediately after the ignition, the voltage at the grid condenser 11 will break down, as this voltage cannot be maintained when the closed circuit current flows. Therefore, as soon as a new echo arrives and the relay responds, the previously ignited tube will extinguish, and when the relay returns to its position of rest, only that tube can be ignited whose condenser is brought to the ignition voltage via the collector 9 and the revolving time giver 8. Instead of a large number of individual glow tubes, it is possible, as will be seen from Figs. 2 and 3, to provide single glow tube elements 14 arranged in a common container 13.

According to the invention, the contacts 15 of the collector 9 and the glow tubes 5 or the glow tube elements 14 are not distributed with uniform spacing over the collector 9 or the length of the scale 6. Whereas the indicating lamps 14 are distributed with equal spacing over the circular scale, the respective contacts 15 of the collector are, in the constructional example illustrated, in the first third of the collector, covered by the time giver 8 immediately after the sound emission, so close to each other that two thirds of all contacts 15 are contained in this first third of the collector. If the time required for one revolution of the time giver 8, as assumed in the constructional example, corresponds to a running distance of the sound of 240 metres and consequently to an altitude of flight of 120 metres, the first 40 metres of the respective scale, with a total of sixty glow members 14, would comprise forty glow members, whereas the whole relay range from 40 to 120 metres altitude would only comprise twenty glow members. Thus, the range of altitudes from 40 to 120 metres is indicated with an accuracy of 4 metres, and the range from 0 to 40 metres with an increased accuracy of 1 metre. At the same time, the range up to 40 metres on

the scale of altitudes 6 covers a relatively four times larger space as compared with the range from 40 to 120 metres, so that two thirds of the scale will contain the first 40 metres, and the last third will contain the range from 40 to 120 metres. Consequently, with the higher measuring accuracy also as increased reading accuracy is obtained.

In this way, a scale is provided which, with a good reading accuracy, owing to the closeness according to the invention and the limitation to a reduced measuring accuracy in the upper measuring range, may be accommodated in a comparatively small space and will still comprise the entire measuring range of the sounding device so that changing from a larger to a smaller range will not be required any more.

The first 40 and the remaining 20 contacts of the collector are arranged with equal spacing. As also the sixty glow members 14 are distributed with equal spacing over the scale, and the time giver 8 revolves with uniform velocity, the indicating values of the glow members in the 40 metres range are exactly 1 metre apart, and in the 40 to 120 metre range 4 metres apart. Therefore, the indication moving over the scale will in both ranges be a true illustration of the actual landing speed or of the speed at which the airplane approaches the surface of the earth.

Fig. 4 shows a form of construction with a voltmeter 16 as indicator to which, on arrival of an echo, is applied for a short period by means of an alternating relay 17 via the revolving time giver 8 and the collector 9 a higher or lower voltage according to the position of the time giver. The collector contacts 15 are connected to a potentiometer 18, the voltage increasing by certain degrees from one contact 15 to the other, commencing at the zero point of the collector.

The arrangement is made so that the sixty contacts 15 are distributed over the whole collector 9 with uniform spacing. However, the potentiometer taps are irregularly distributed so that, with a total voltage range of 120 volts, each of the first forty contacts of the collector will receive 1 volt, whereas there will be 4 volts to each of the remaining twenty contacts. Therefore, the first forty contacts comprise the voltage range from 0 to 40 volts, and the remaining twenty contacts comprise the voltage range from 40 to 120 volts. Thus, the range of altitudes from 80 to 120 metres is correspondingly extended on the voltmeter 16, whereas the range of altitudes from 0 to 80 metres is contained in the first third of the voltmeter scale 6.

By means of the irregular distribution of the potentiometer taps it is possible, as will be seen, to increase the reading accuracy, but not the measuring accuracy, because, by choosing larger voltage taps, the individual indication values are only extended, but not also increased. For this purpose, a corresponding increase of the collector contacts would be required in a similar way as in the constructional example shown in Figs. 1 to 3.

In order to obtain a permanent indication also when using a voltmeter, a condenser 19 may be connected parallel to the voltmeter, this condenser being charged during the short connecting period and the closing of the contact by the time giver 8, and thus retaining the respective voltage up to the next sound emission or automatically operated mechanical disconnection or quenching following the time giver 8 by less than 360°, or up to the next echo to be indicated.

If desired, a device may be provided for shifting the irregular distribution of the grading over the scale. Such shifting may, for example, be effected by turning the collector with the irregular arrangement of contacts relatively to the zero point controlling the sound emission, and by moving or disconnecting the connections between the collector contacts and the indicating members or the potentiometer, for example via a second switching collector with uniformly arranged contacts, so that the zero point of the scale will coincide with the zero point of the collector or with the moment of the sound emission. At the same time, it is possible to change over to another scale division. In addition, it would, of course, be possible, by varying the number of revolutions of the time giver, to alter the measuring range or to effect the sound emission only after the second, third, etc. revolution of the time giver, or to make the mentioned irregular distribution only for sections of the collector. Furthermore, a device could be provided for varying the distribution itself, for example by changing to a collector with different distribution.

Fig. 5 shows, for example, a constructional form, in which it is possible to change to two different scales. In this case, there are provided two rigidly connected collectors 19 and 20 with correspondingly different distributions, co-operating with a time giver 21 with two brushes insulated with respect to each other, which, by means of a switch 26, may be connected alternately by contact rings 22, 23 and brushes 24, 25 to the circuit controlled by the echo impulse. Both collectors 19 and 20 have an equal number of, for example, sixty contacts, but in a different irregular distribution, for example so that the collector 19 contains forty contacts in the first half A, and the remaining twenty contacts in the second half B, whereas the collector 20 contains forty contacts in the second half D, and in the first half C (always calculating from the zero point or the point of the sound emission) the remaining twenty contacts with a corresponding spacing. Simultaneously with the throwing of the switch 26, a corresponding other scale is inserted in the indicator, for example by illumination or exchange (turning of a scale drum). In the same sense, this arrangement may be applied to the potentiometer method.

The rotating potentiometer according to Fig. 4 consists of a contact arm 28 driven at a uniform speed and sliding on a circular resistance. The resistance 29 is applied to a source of voltage. It is assumed to give a total voltage drop of, for example, 120 volts. If this voltage drop would be distributed over the whole resistance 29 and if the contact arm 28 would be moved at a uniform speed so as to slide over the resistance within a period corresponding to a running distance of the sound of 240 metres or to an altitude of flight of 120 metres, an altitude of 1 metre would be indicated by 1 volt on the voltmeter within the entire measuring range.

In order to obtain an increased accuracy in the lower measuring range, the potentiometer resistance 29 is shunted, for example in the two upper thirds of its angular range, corresponding to the altitude of 40 to 120 metres, by a resistance 20 in such a way that 80 volts of the entire voltage drop are taken up by the first third and only 40 volts by the two upper thirds of the resistance 29. Therefore, in the range of altitudes from 0 to 40 metres, each metre is indi-

cated on the voltmeter by 2 volts, and in the range of altitudes of 40 to 120 metres, only by  $\frac{1}{2}$  volt, so that for the range of altitudes from 0 to 40 metres the accuracy of measuring is four times as great as for the range of altitudes from 40 to 120 metres. Correspondingly, the range of altitudes from 0 to 40 metres is extended on the scale of altitudes of the voltmeter 16 over two thirds of the entire length of the scale, whereas the range from 40 to 120 metres is contained in one third of the length of the scale. Thus, the accuracy of measuring is suddenly changed, when passing from the first third to the shunted portion of the rotating potentiometer, to the fourth part, whereas it remains unchanged within the two ranges.

According to the condenser method shown in Fig. 7, the same scale is obtained by suddenly changing the charging resistance, after each sound emission with a running time of the sound corresponding to an altitude of 40 metres, from a smaller to a larger value so that the voltage at the time circuit condenser 31 before changing over will vary four times as much as after changing over. Preferably, the final voltage amounts only to a fraction of the available charging voltage so that the charging is only effected in the straight portion of the charging curve. Thus, an almost linear division of both scale ranges is obtained.

In the example illustrated, the change to a larger charging resistance is effected by disconnecting one of two parallel charging resistances 32, 33 by means of a relay 34. The relay 34 is operated by a tipping connection, consisting as usual, of a charging circuit with a source of voltage, a condenser 35, a charging resistance 36 and a tipping circuit with gas discharge tube 37, via which, upon reaching the ignition voltage, the condenser is automatically discharged and therewith causes a current impulse to pass through the relay 34. The tipping connection is arranged so as to operate synchronously with the sound transmitter of the echo sounding device, but with a time or phase shift with respect to the sound impulses of 80 metres running distance of the sound or 40 metres altitude. For controlling the tipping circuit as well as the time

giver circuit, a short circuiting contact 38 or 39 operated by the transmitting device or by the sound impulse may be provided.

In order to obtain a jumping and sectionally uniform accuracy of measuring, it is also possible to do without varying the resistance. Thus, for example, it is possible with the rotating potentiometer method to provide a uniform resistance over the entire angular range, whereas for obtaining the irregular voltage distribution, one or several additional partial voltages are provided, which are connected parallel to certain angular ranges of the circular potentiometer resistance. Also with the time circuit method it is possible to do without varying the resistance, by varying the charging voltage of the time circuit during each time circuit period so that the charging in the different periods is effected according to different charging curves.

When using a plurality of indicating members, it is, of course, possible to use ordinary glow lamps or any other indicating members instead of gas discharge tubes.

Furthermore, it is possible to use an instrument with momentary indication instead of the permanent indication so that the indication will end or decay when the echo impulse ceases, although the permanent indication, especially when using one single scale comprising the entire measuring range of the instrument, is of special importance.

The new device may also be used with advantage for measuring distances in water according to the echo sounding method in a corresponding way. In this case, it will often be an advantage to increase the succession of soundings according to the respective distance as much as possible, which is mostly not necessary in the case of landing altimeters for airplanes owing to the comparatively small total measuring range, especially if a permanent indication is provided.

Finally, it is also possible to place the portion of the scale, which is preferred in the way mentioned with regard to the reading or measuring accuracy, somewhere else where it is desired, for example in the middle of the scale or to provide various ranges of this kind.

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MICRO-CHRONOMETER, ESPECIALLY FOR MEASURING  
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2 Sheets-Sheet 2

FIG. 6.

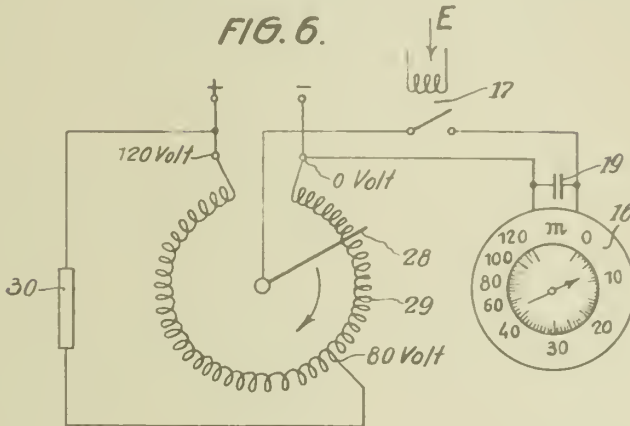


FIG. 7.

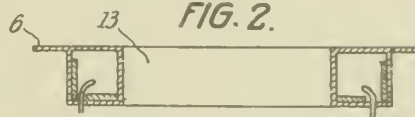
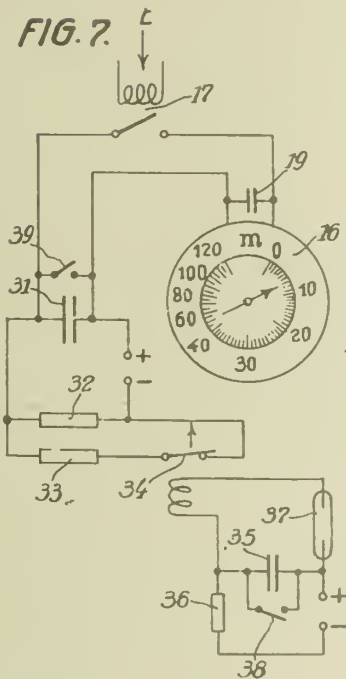
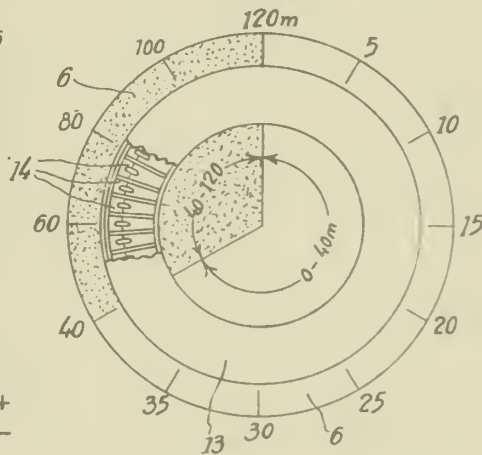


FIG. 3.



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# ALIEN PROPERTY CUSTODIAN

## METHOD OF REMOTE CONTROL OF ANGULAR, AZIMUTH, ZENITH OR RECTILINEAR VARIATIONS, PARTICULARLY, FOR COMPASS INDICATION AND VARIATION AND DEVICE EMBODYING SAID METHOD

Carlo Bresciani, Ponte S. Pietro, Bergamo, Italy;  
vested in the Alien Property Custodian

Application filed February 9, 1940

The present invention concerns a method of remote control of angular, azimuth, zenith or rectilinear variations, particularly for compass indication and variation and the device embodying said method.

The method according to the invention consists essentially in that at least four ohmic resistors are employed, two of which are either fixed or adjustable and two are variable, and which are suitably connected by a circuit, an electric indicating means, a source of electromotive force so that the variation of the resistance of one of the variable resistors is effected by the other, thus obtaining the possibility of a remote control.

The device embodying said method is characterized by the fact that it comprises in combination at least four ohmic resistors, two of which are either fixed or adjustable and two are variable, and which are suitably connected by a circuit, an electric indicating means and a source of electromotive force.

In a preferred embodiment, the device comprises the variable resistor wound in a toroidal form preferably on an insulating support, the outer part of said variable resistors being so arranged as to cooperate with lamellar contacts or brushes for the connection with the circuit.

The device provides that one of the variable resistors is drivably connected, by manual drive, or directly engaged with the displacements of the movable body, the positions of which are to be transmitted, the other variable resistor, suitably actuated, reproducing the positions of the movable body upon the displacements by the indicating instrument.

Advantageously this latter variable resistor is so actuated as to reproduce synchronously and simultaneously the displacements of the movable body by a driving means actuated in the suitable direction by the displacements performed by the indicating instrument.

The above and other features of the invention will appear from the following description which refers to the attached drawing, given by way of indicative example only.

The attached drawing diagrammatically shows the device according the invention with some organs represented by sectional and perspective views.

In the drawing, 10 indicates the feeding battery of the apparatus, 11 and 12 are two fixed ohmic resistors of suitable resistance or of the adjustable type, so that calibration can be easily attained when mounting the device.

An indicating device 13 of the central zero galvanometric type is inserted as hereinafter explained.

A variable ohmic resistor 14 consists of a toroidal or like coil, the turn—of which are wound on a circular support 15 of insulating material. The turn—which result to be on the outside of said support are uncovered to provide a contact with an elastic metal strip or brush 16 so as to realise the variation of resistance continuously and in the desired manner. A resistor 17 of the above type is similarly realised, that is by winding a coil on a circular support 18 of insulating material so that it assumes complexly—a toroidal or like shape. Similarly to the above the outer turn—are in contact with an elastic metal strip 19 to provide the desired variation of resistance.

One end of the resistor 14 is connected to a flat spiral spring 20 fixed on the rotational spindle (not shown in the drawing) of the disc 15. The latter is rigidly connected to a gear 21 engaging with the relative worm gear 22 driven through a suitable drive 23, by a crank 24 or other suitable means to displace when desired the disc 15, thus varying the resistance of the resistor 14. Resistor 17 has the disc 18 rigidly connected to an actuating knob 25 or the like, while a pointer 26 cooperates with the graduations 27 provided on said disc. The connection of the fixed and variable resistors and the other organs referred to above is performed according the Wheatstone bridge diagram. Namely fixed resistors 11 and 12 are connected in series as well as variable resistors 14 and 17. The terminals of said resistors are so connected to one another to dispose said couples of resistors in parallel and feed the same by the battery 10.

The indicating instrument 15, instead, is placed on the diagonal of the parallelogram formed by said resistors, i. e. between the connection of each couple of fixed and variable resistors. In the circuit switching means for the electric energy may be inserted.

It is apparent that if  $R_1$  indicates the resistance of the fixed resistor 11,  $R_2$  that of resistor 12 and  $R_3$ ,  $R_4$  respectively indicate those of the variable resistors 14 and 17, when in the diagonal whereon indicating instrument 13 is inserted, no current circulates, the relation:

$$\frac{R_1}{R_2} = \frac{R_3}{R_4}$$

must exist, that is the difference of potential at the terminals of said instrument will be zero. If the resistance of one of the two resistors 14

and 17 is varied, no more equality will exist in the above proportion: the resistance of the other of the variable resistors must be varied to restore the balance.

It is apparent that if the variable resistor is either engaged with or even anyhow actuated, even manually, in dependence from the displacements performed by the movable organ, whereof the angular or linear positions (rotations or translations) are to be transmitted, actuation of the instrument 13 will be caused, the operator will then displace the resistor 11 to bring to zero said instrument. The new position taken by the disc 18 coincides with the position of the movable organ, so that said movements are synchronised owing to the univocal correspondence of each resistance of resistor 14 to one single resistance of resistor 17.

If the transmission of the position of the movable organ is desired to take place simultaneously with its movement, it is sufficient to provide the movable armature of the instrument 13 cooperating with a couple of contacts to close, either directly or through relays or the like, the circuit of suitable means for actuation in the proper direction, which by operating on the disc 18 should vary the resistance of the resistor 17, thus re-establishing the balance of the bridge. Thereupon, feeding of the actuating means stops, owing to the aperture of one of the contacts of said couple due to the return of the instrument to zero.

The device realised according to illustrated diagram is advantageously convenient to auto-

matically remotely transmit the course of a vehicle, if the resistor 14 is suitably engaged with the movable armature of a compass of any known type. Besides this application, the device may be used to remotely transmit the position of movable organs such as weapons indicators of speed and number of revolutions, and so on. It is also apparent that the indicating instrument 13 instead of being a galvanometer, may consist of any indicator of known type, such as for instance a cathode ray tube or Braun tube, and particularly a 6E5 valve known in the wireless art under the denomination of "magic eye" or "electric eye". This latter expedient is particularly suitable when an instrument deprived of inertia is desired.

In the case that the movable body has a rectilinear motion, the remote transmission of its position can be realised either by engaging the disc 15 with known driving means to transform the rectilinear motion into a rotary motion (i. e. by crank and connecting rod) or placing the variable resistors on straight supports so as to reproduce the displacements of the movable body. The variable resistors 14—17 may have a linear quadratic, logarithmic or other variation to perform the desired displacements.

It is intended that in the practice the constructional details, as well as the destinations may any how vary without exceeding the limits of the inventions.

CARLO BRESCIANI.





# ALIEN PROPERTY CUSTODIAN

## COLLECTORS FOR ELECTRIC MACHINES

Hans Zöllner, Lauf on the Pegnitz, Germany;  
vested in the Alien Property Custodian

Application filed February 16, 1940

This invention relates to a collector for electric machines comprising commutator bars or segments of the carbon type.

It is an object of the present invention to provide a system for reliably securing the carbon segments in the commutator.

Another object of the invention is to permit adjustment of the pressure under which the segments are held in the commutator.

With these and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which:

Fig. 1 is a fragmentary axial section of a known type of commutator, comprising commutator bars of metal.

Fig. 2 is a fragmentary axial section of a commutator having the invention applied thereto.

Fig. 3 is a similar view, showing a modification of the form shown in Fig. 2.

Fig. 4 is a similar view, showing a further modification in which the ends of the carbon bar are roof-shaped and held in clamping devices having conical annular grooves.

Similar reference numerals denote similar parts in the different figures.

Referring now to the drawings in greater detail, and first to Fig. 1, showing the known construction, it will be seen that a metal bar 1 is clamped dove-tail fashion between two threaded rings 2 and 3 screwed on a sleeve 4 on a shaft 5. The commutator bars are thus stressed by bending and shearing stress. While such stresses can be taken up by metal bars, for example, copper bars, which are usually employed for commutators, commutator bars of the carbon type are liable to breakage by bending and shearing stresses, although carbon material has a high compressive strength.

With this fact in view, the invention contemplates the provision of a commutator in which the dovetail fixing system is modified in a manner to avoid any bending and shearing stress and in which the carbon segments are exposed to compressive stresses only. To this end, the centrally directed pressure exerted by the conical fixing rings is taken up by supporting surfaces acting upon portions of the commutator bars arranged at a smaller diameter and in direct opposition to

the clamping surfaces of the screw rings, whereby pure compressive stresses are obtained.

Referring first to the construction shown in Fig. 2, it will be seen that the sleeve 4' is formed with a thickened portion 4'' opposed to the surfaces 6 and 7 of the clamping rings 2' and 3'. Therefore, the forces now attack the carbon bar or segment 1' in direct opposition, as indicated by the arrows, so that compressive stresses only are resulting.

The commutator segments 1' may consist of any suitable carbon material, but advantageously artificial carbon material is used, which may be brought into the desired shape, and more particularly the shape shown in Fig. 2, by pressing and/or grinding operations. The clamping rings 2' and 3' may consist of any suitable material and in case the material is electrically conductive, separating layers 8 and 9 of insulating material, such as mica, must be provided between the rings and the carbon segments. Also, a layer 10 of insulating material is provided between the base surface of the carbon bar and the thickened portion 4'' of the sleeve 4'.

Where it is desired that the carbon segments shall have a substantially larger diameter than the clamping rings, the carbon segments may be shaped as shown at 1'' in Fig. 3, forming a rectangular and a trapezoid portion. Otherwise, the construction of Fig. 3 is the same as Fig. 2.

According to a further modification, shown in Fig. 4, the carbon segments 1''' may be formed with roof-shaped ends and held in annular conical grooves comprising suitable inner and outer conical surfaces 6', 7' and 6'', 7'' of the clamping rings 2'' and 3'', without using the base surface of the carbon bars for supporting the same. In this case, no thickened portion is required on the sleeve 4. Of course, where the clamping rings 2'' and 3'' are made of a metallic material, insulating layers may again be provided to prevent electric contact between said clamping rings and the carbon segments.

It will be understood that it is easily possible to screw the clamping rings tight again if the parts have got loose by thermal expansion or the like.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

HANS ZÖLLNER.



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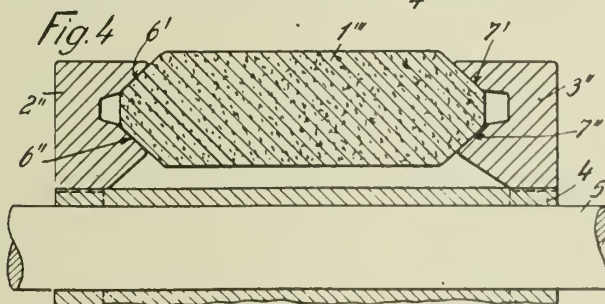
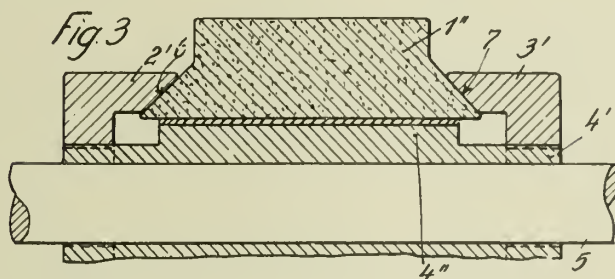
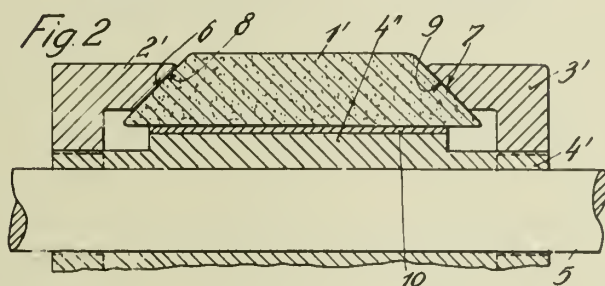
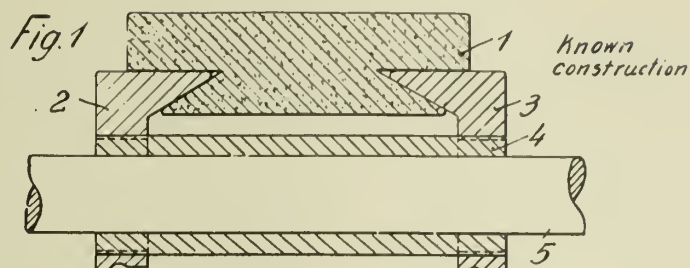
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COLLECTORS FOR ELECTRIC MACHINES

Filed Feb. 16, 1940

Serial No.

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# ALIEN PROPERTY CUSTODIAN

## COMMUTATOR BARS

Hans Zöllner, Lauf on the Pegnitz, and Philipp Voegler, Rothenbach on the Pegnitz, Germany; vested in the Alien Property Custodian

Application filed February 16, 1940

This invention relates to commutator bars or segments of the carbon type and has particular reference to the electric connection of such bars with the ends of the windings of the rotor of the respective electric machine.

It is the object of the present invention to provide means for ensuring a very reliable and low resistance contact of the wire ends to the bars, more particularly by a soldering operation.

With this and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings, in which:

Fig. 1 is a perspective view of a known commutator bar, consisting of metal.

Fig. 2 is a perspective view of a commutator bar of the carbon type, having the invention applied thereto.

Fig. 3 is a side view, partly in section, of a carbon bar having a metal lug screwed thereto.

Fig. 4 is a perspective view of a carbon bar and metal lug to be joined by a pressing operation.

Fig. 5 is a plan and Fig. 6 a side view of an embodiment comprising a metal lug applied to the end of the carbon bar by a casting operation.

Similar reference numerals denote similar parts in the different Figures.

Referring now to the drawing in greater detail, and first to Fig. 1, this Figure shows a metal segment  $a_1$  including a connecting lug  $b_1$  formed integral therewith. The ends of the windings of the rotor of the respective electric machine are in this case secured in a recess of the lug, by soldering, as indicated at  $c_1$ .

Of course, this simple procedure cannot be applied in the case of collector bars of the carbon type, consisting, for instance, of artificial or synthetic carbon, due to the non-metallic features of such carbon bars.

To remove this difficulty, my invention, in a broad aspect, consist in providing a metal lug  $b_2$  on each carbon bar  $a_2$ , as shown in Fig. 2, so as to permit a simple connection of the ends  $c_2$  of the windings of the rotor to their associated bars. Further important features of the invention relate to the intimate connection to be established between the carbon bar and the metal lug.

Fig. 3 shows a simple connecting method, by means of screws  $d$  extending through bores in the metal lug  $b_2$  and screwed into threaded holes in the carbon bar  $a_2$ .

Fig. 4 illustrates a method in which the corresponding slotted metal lug  $b_2'$  is forced on a projection  $a_3$  of the carbon lug and held thereon by adhesion. It will be understood that the forced engagement of the parts may be obtained also by another configuration of the engaging portions of the two parts.

Figs. 5 and 6 show a modification in which the metal lug  $b_2''$  is applied on the commutator bar  $a_2''$  by a metal casting or squirting or injection moulding operation. The metal lug has been indicated in this case in dash and dot lines to show more clearly the projection  $a_3'$  of the carbon brush which is provided in a dove-tail shape but may be differently shaped, if desired. The cast metal, e. g., aluminium, shrinks on cooling down, so that a very intimate mechanical engagement and electric contact is ensured between the carbon bar and the metal lug.

The carbon bars may be pressed or ground into the desired shape and more particularly the faces engaged by the metal lug member are advantageously ground to permit intimate engagement and electric contact.

To ensure good contact between the carbon and metal lug faces the respective carbon faces may additionally be metallised, for example, in a metal spraying process and coated with a well-conducting metal surface, such as, copper, before the metal lug is applied by a screwing, casting or pressing operation.

Where the metal lug consists of a metal which it is difficult to solder, such as, aluminum, the metal lug or at least the surface portions of the same where the cables are to be connected may also be coated with a metal which lends itself better for soldering, such as, copper.

Furthermore, it is contemplated to form the metal lug surface directly on the carbon bar, which is in this case formed integral with a carbon lug, by metallising said carbon lug, for example, by a galvanic or metal spraying process, using preferably copper as a coating metal. For example, the lug  $b_2$  in Fig. 2 may consist of carbon coated with a copper layer indicated by the blank surfaces, more particularly at the point where the cable  $c_2$  is connected.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

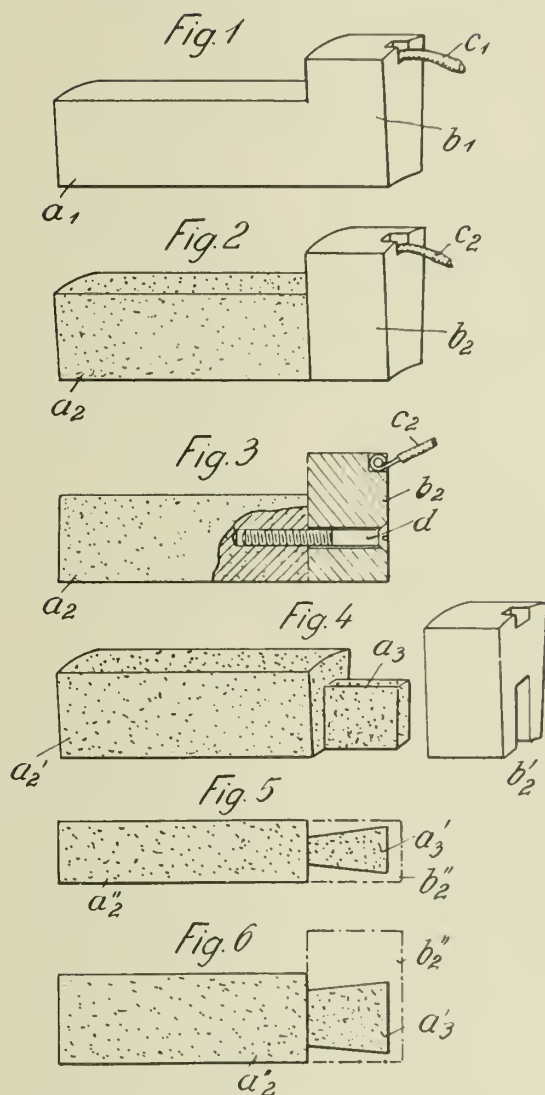
HANS ZÖLLNER.  
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MAY 18, 1943.  
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# ALIEN PROPERTY CUSTODIAN

## COKE OVENS

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Application filed February 26, 1940

The invention relates to coke ovens and more particularly to the arrangement of the gas burners or nozzles in connection with the heating flues of such an oven. There are coke ovens known being heated by rich gas only i. e. by coking gas gained during the coking process. Other types of coke ovens, the so called compound ovens are heated alternatively by rich gas and by poor gas i. e. by a gas generated in special gas producers burning cheap coals of a low calorific power. If rich gas is burnt it is very useful to add to the rich gas the waste gas from the heating flues of the coke oven in order to produce an elongated flame extending over the entire altitude of the heating flue. If the coke oven is heated with poor gas an adding of waste gas is not necessary respectively undesirable as a sufficiently long flame is already produced and thus an admission of waste gas would only cause a reduction of temperature.

The object of the present invention is to admit waste gas to the rich gas in a very useful and simple manner. The idea of the invention is as well directed to the use of compound ovens as to the use of ovens heated by rich gas only.

Hitherto the admission of waste gas to the rich gas was generally effected in such a way that one part of the waste gas coming from the heating flues was added to the rich gas conduction by means of a blower. This arrangement required a very complicated structure of the plant and besides this it demanded special precautionary measures in order to avoid explosions when a change of the gas admission was made.

Further-more coke ovens are known in which one part of the waste gas is circulated through couples of heating flues and in which special channels or flues for the waste gas are avoided. For this purpose at both ends of the heating flues a connection is provided by disposing openings in the separating wall. However, this arrangement has the drawback that, if poor gas is used, the circulation of the waste gas cannot be eliminated and the aforementioned reduction of temperature takes place.

It is the object of the invention to connect directly the rich gas burners or nozzles ending into the single heating flues with the waste gas channels in such a manner that an ejector is formed. The structural features of this arrangement may be varied. It is very useful especially if rich and easily sooting gas is used to connect the rich gas nozzles by special little channels with the collecting channel for the waste gas or with the lower part of the regenerative furnace or the re-

cuperators. Thus already cooled waste gas—of a temperature of about 300° C—is added to the rich gas and the danger of sooting is diminished. However, it is also possible to conduct the waste gases before passing the regenerators or recuperators to the rich gas nozzles or rich gas burners. For this purpose a couple of coaxing heating flues may be connected at the end by an U shaped or curved channel into which end the rich gas nozzles like ejectors.

At all events the inventive idea may be brought into practise at already existing ovens with only a few little alterations, i. e. only the little channels for the waste gas are to be provided. The arrangement of special fans is not necessary as the rich gas draws the desired quantities of the waste gas by the burners or nozzles.

The effect of the ejector may be controlled in different manners, f. i. by adjusting or altering the position of the nozzle tubes through which the rich gas is led or by exchange of the nozzle heads thus effecting the suction of smaller or greater quantities of waste gas.

In the accompanying drawings several examples are shown how the invention may be brought into practise.

Fig. 1 shows a longitudinal section of a coke oven heated with rich gas in connection with the regenerator.

Fig. 2 shows a cross section of a part of a range of coke ovens.

Fig. 3 shows at the left side a section on line IIIa—IIIa of Fig. 2 and at the right side on line IIb—IIb of Fig. 2.

Fig. 4 is a horizontal section on line IV—IV of Fig. 3 on an enlarged scale.

Fig. 5 shows the ejector-like connection of the rich gas nozzles with the waste gas channels according to Fig. 2 on an enlarged scale.

Figs. 6–8 represent the structure according to the invention in a coke oven alternatively heated by rich gas and by poor gas.

Fig. 6 is a vertical section on line VI—VI of Fig. 7.

Fig. 7 is a vertical section on line VII—VII of Fig. 6.

Fig. 8 is a cross section on line VIII—VIII of Fig. 6.

Figs. 9–11 show an other example of an oven alternatively heated with rich gas and poor gas.

Fig. 9 is a section on line IX—IX of Fig. 10.

Fig. 10 is a section on line X—X of Fig. 9.

Fig. 11 is a section on line XI—XI of Fig. 9.

Figs. 12–14 show a third example of an oven alternatively heated with rich gas and poor gas.

Fig. 12 is a vertical section on line XII—XII of Fig. 13.

Fig. 13 is a vertical section on line XIII—XIII of Fig. 12.

Fig. 14 is a longitudinal section on line XIV—XIV on Fig. 12.

The heating of the coal chambers 1 is effected in an already known manner over the pairwise coacting heating flues 2, beneath which the regenerators are provided. The admission of the rich gas is effected according to the example shown in Figs. 1-5 through the channels 3a and the nozzles 3 which end like ejectors into the flues 10. These flues or channels join the two coacting heating flues. Through the nozzles 4 air being heated in the regenerators 5 is admitted to the heating chambers.

The rich gas entering the heating flues 2 through the nozzles 3 draws the necessary quantity of waste gas over channel 10 from the approximated heating flue and is mixed with it before ignition takes place. Through the air channels 7 the air is led to the regenerators 5.

The working of the oven is effected in an already known way by changing the way of the gases within certain intervals and—with reference to Figure 5—alternatively sending them over the right or the left channel 3 into the heating flues 2.

For controlling the ejector effect changeable nozzles 3 may be provided. The changing may be done over the pits 12 being disposed above the heating flue 2.

The structure represented by Figs. 6-8 shows an oven being alternatively heated with rich gas and with poor gas. Beneath each regenerator

two channels 7 and 7' are provided of which the one admits the air and the other one the waste gas alternatively to the regenerative furnace in order to be heated. The admission of the rich gas and the admixture of the waste gas is effected in the same manner as described with reference to Figs. 1-5 only the waste gas channels show a somewhat different form.

The structure represented by Figs. 9-11 also refers to an oven alternatively heated with rich gas and poor gas. The rich gas is led through nozzle tubes 6 disposed in the channels 9 and 9'. The air enters the heating flues through the little channels 4 as it is already shown in the before described example. The admission of the gas is effected alternatively through the channels 9 and 9' in an already known manner.

In order to control the ejector effect the tubes 6 may be displaced upward or downward or the nozzle heads may be changed.

The Figs. 12-14 show a further modification of a coke oven being alternatively heated by rich gas or by poor gas. As it is already shown in the Figures 9-11 the rich gas conduction 3a is placed beneath the regenerators and the rich gas is led into the channels 9 respectively 9' through the nozzles 9 and 9' but the waste gases are not taken from the regenerator respectively from the collecting channels 7—as is shown in the Figures 9-11—but from the lower part of the heating flues 2 directly, using the connecting channels 10 as is shown in Figs. 1-5.

The invention may also be applied to other kinds of ovens.

JOSEF SCHÄFER.

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BY A. P. C.

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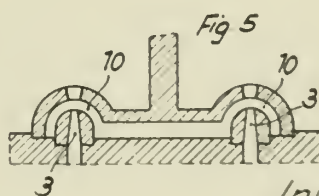
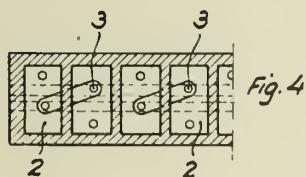
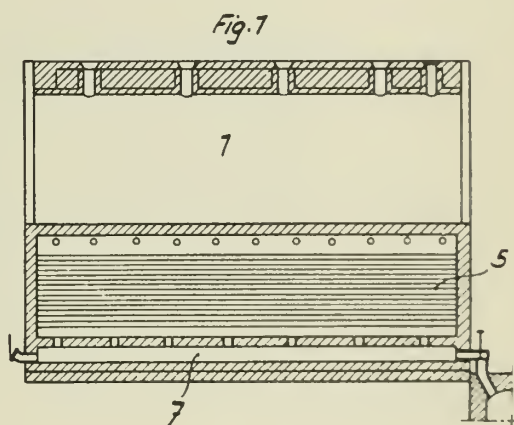
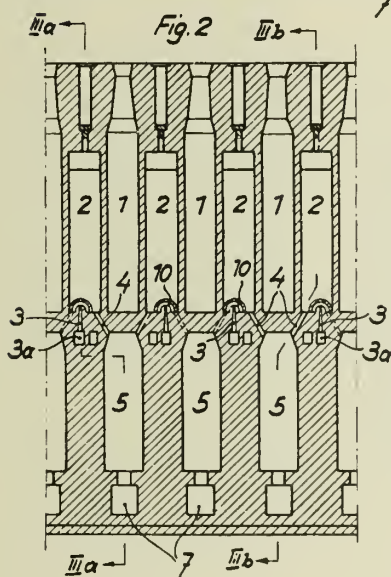
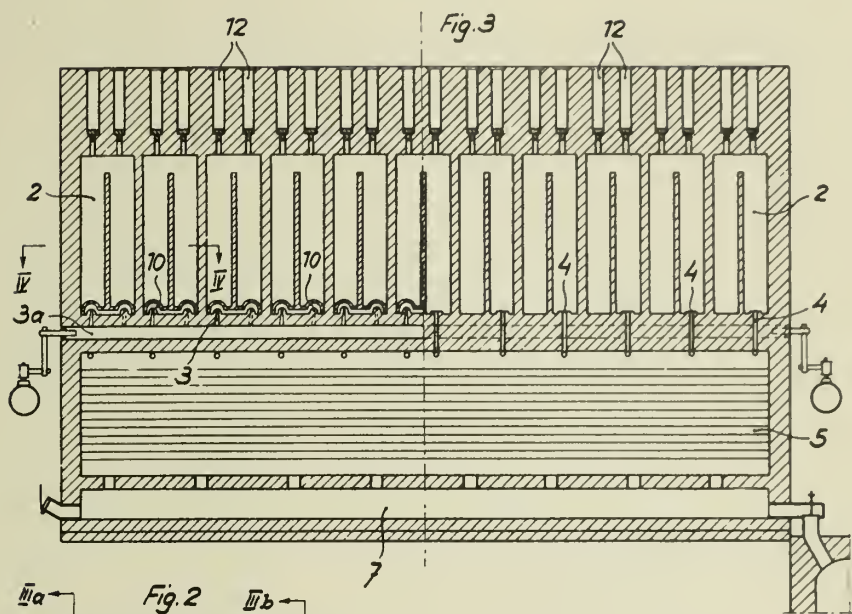
COKE OVENS

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4 Sheets-Sheet 1



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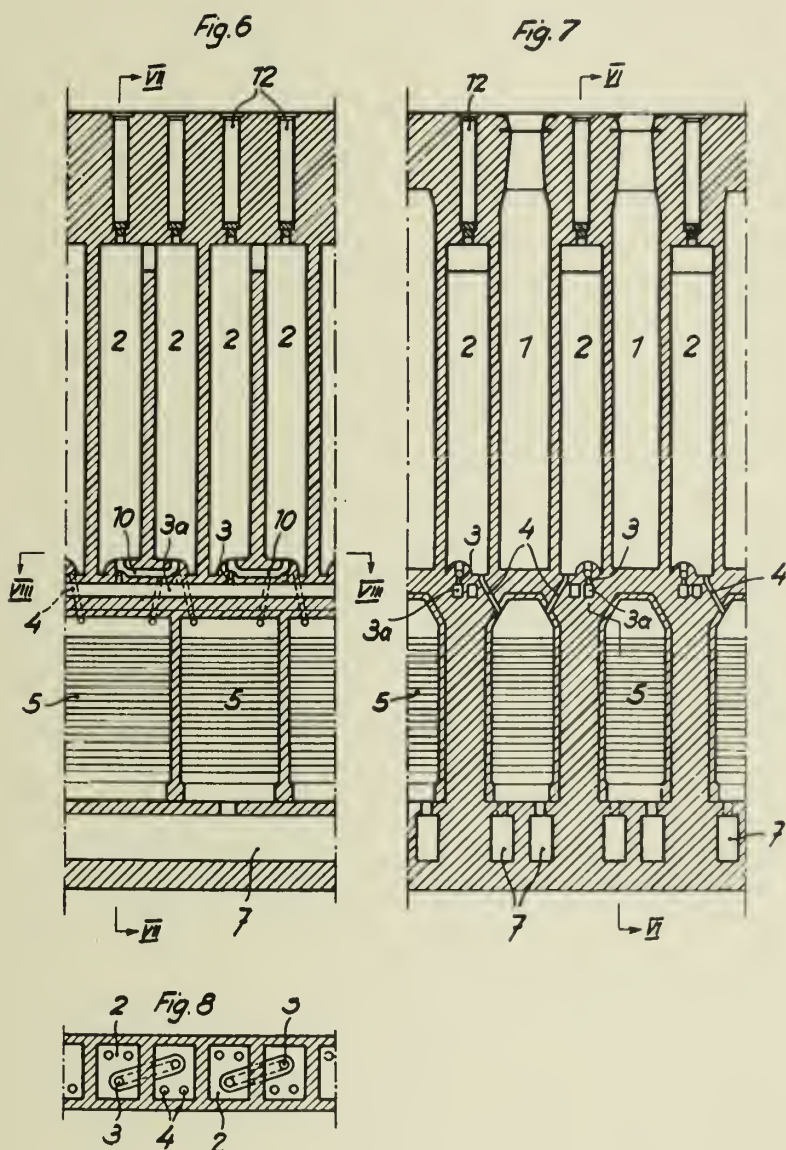
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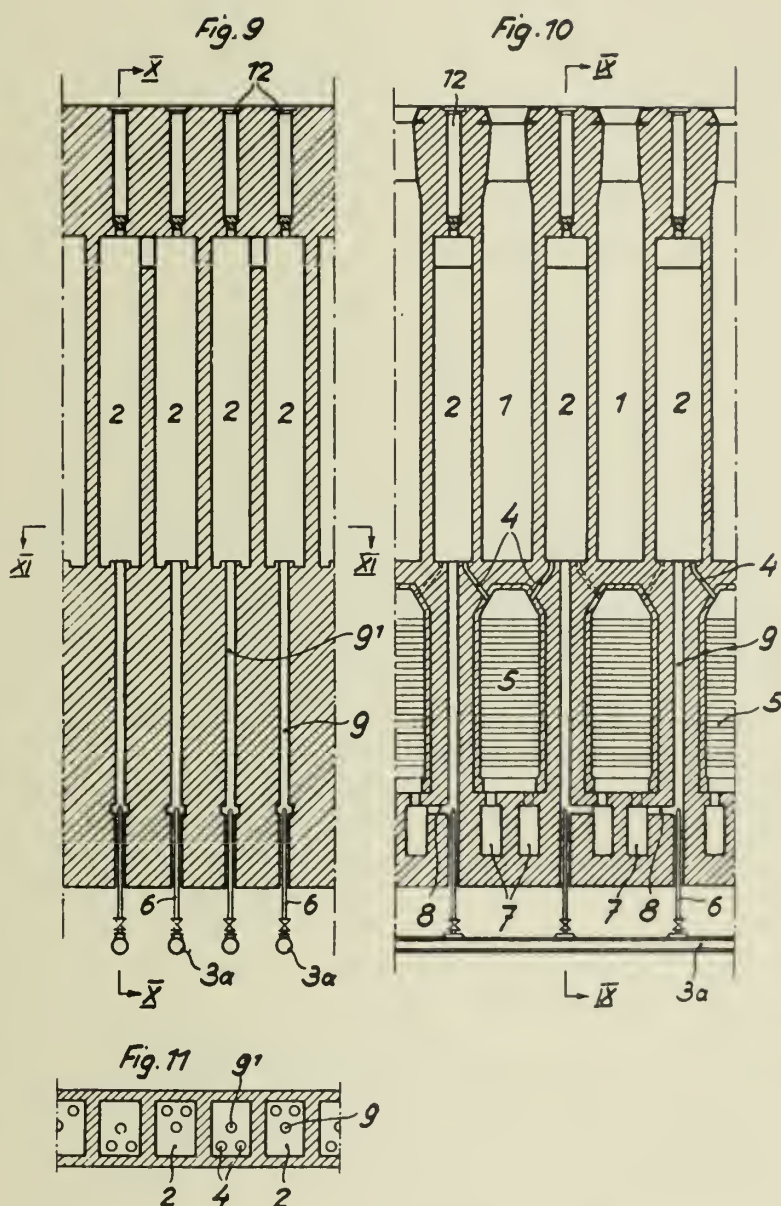
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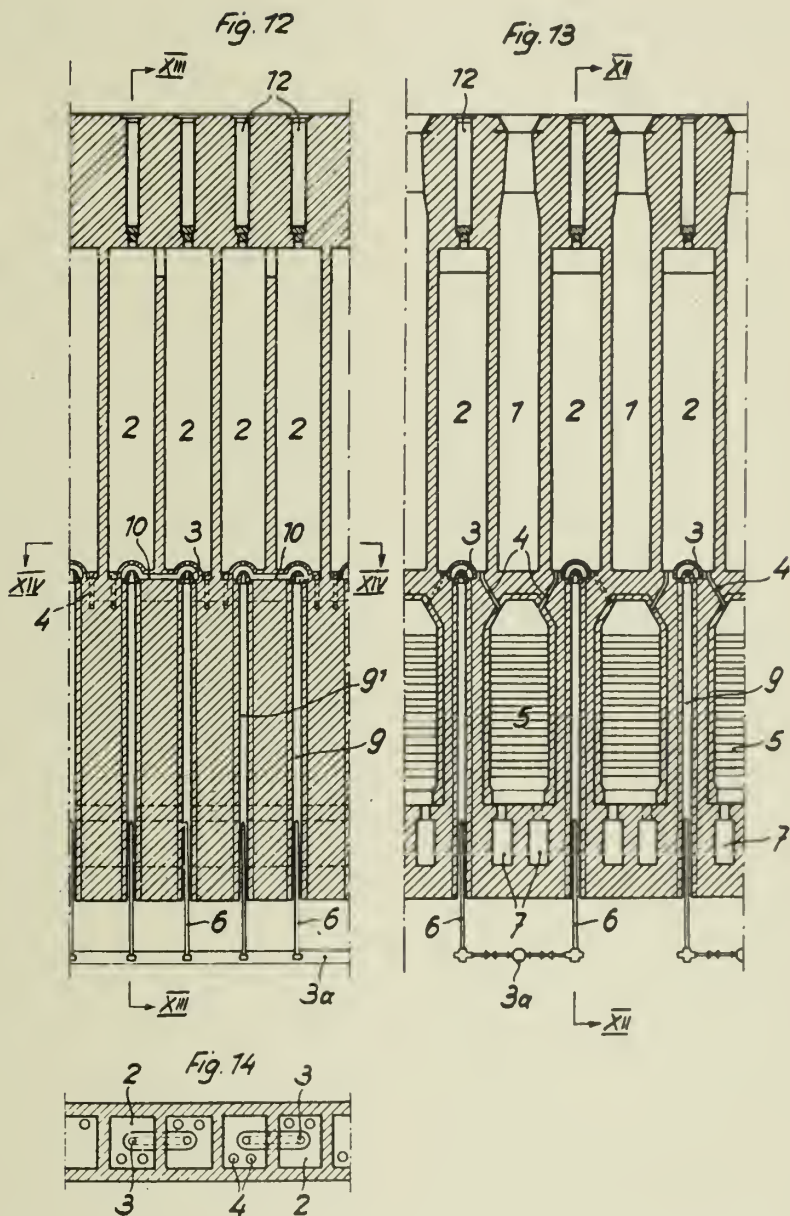
COKE OVENS

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4 Sheets-Sheet 4



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# ALIEN PROPERTY CUSTODIAN

## REMOTE READING ELECTRIC INDICATOR GAUGE

Lucien Alfred Maurice Corset, Paris, France;  
vested in the Alien Property Custodian

Application filed February 27, 1940

The present invention has for its object a remote reading electric indicator gauge, based on the well known principle of the potentiometer, this apparatus possessing, inter alia, the following features:

The transmitter of the indicator gauge is formed by the combination, on the one hand of a mechanical control device provided with a lever of appropriate shape, which is pivoted on the upper end of two vertical guides fixed to a base which is mounted on the tank to be gauged, along which guides there moves a float whose vertical position controls the angular position of the aforesaid pivoted lever, the angular movement of which varies, by means of a rack and pinion system, the angular position of a transmitting member, with, on the other hand a potentiometer (or like member), the circular winding and the rotary slider of which are arranged in a removable case provided with output terminals and fixed on the base of the aforesaid mechanical control device.

The receiver (which may be double) is formed by the combination, on the one hand of two coils supplied by means of a source of direct current and through the potentiometer of the transmitter, said coils being placed in the extension of each other (and not superposed at right angles to each other, as is the case in the known indicators), with, on the other hand a movable system formed by an armature having two blades made of magnetic metal and dynamically balanced by means of an auxiliary armature made of non-magnetic metal arranged along the bisector of the complementary angle of the angle (120°) formed between the blades in question.

Other details and features will become apparent in the course of the ensuing description made in conjunction with the accompanying drawing in which there has been shown diagrammatically and by way of a non-limitative example, one embodiment of the remote reading electric indicator gauge which is the object of the present invention.

Fig. 1 shows (partly in section) a general view of the transmitter;

Fig. 2 is a vertical section of the electric part of the transmitter;

Fig. 3 shows a part of Fig. 2 and more particularly the electric connections of the potentiometer;

Fig. 4 is a plan view of the transmitter with the outside connections;

Fig. 5 is an elevational view of the case for

the electric part and of the base of the transmitter;

Fig. 6 is a plan view of Fig. 5;

Fig. 7 is a front view of a double receiver;

Fig. 8 is a side view thereof;

Fig. 9 is a section along the line IX—IX of Fig. 10;

Fig. 10 is a view in partial section along the line X—X of Fig. 9;

Fig. 11 shows a modification of Fig. 7;

Figs. 12 and 13 show plan views of certain details of the receiver;

Fig. 14 shows the diagram of the connections of the whole apparatus;

Fig. 15 is a plan view of the float;

Finally, Fig. 16 is a section along the line XVI—XVI of Fig. 15 and shows a detail.

As shown in the accompanying drawing, the transmitter comprises a circular base 1 fixed to the upper part of the tank R to be gauged, which base supports the mechanical part of the apparatus, viz. two vertical guides 2, between which can pivot a bent vertical lever 3 pivoted at 4 on the upper part of the guides 2 along which there moves, in the vertical direction, a double float 5 provided with guide rollers 6. The lever 3 carries a rack 7 meshing with a pinion 8 fast on a vertical spindle 9 which is supported by one of the two vertical guides 2 and passes through a stuffing box 10 mounted in the base 1, which stuffing box prevents any projection of liquid into the upper part of the transmitter in case of jerks imparted to the tank. The upper end of the spindle 9 carries a small actuating crank 11.

The lever 3 is constantly subjected, in the direction of the arrow F, to the action of a retracting spring 12, an arrangement whereby said lever always tends to bear on the same side against one of the rollers 6, so that the effect of the play between said rollers is eliminated, the action of the aforesaid spring being optionally completed by that of another roller 6.

The curve of the lever 3 may be made to take into account the shape of the tank, in order to correct the discontinuity of the space between the graduation in the receiver which will be described hereinafter, and to obtain more even graduations in said receiver in the parts of the scale which correspond to the low points of the tank, for which greater accuracy is required.

The fulcrum 4 of the lever 3 is very high, which enables the float to rise up to the top of the tank, the remaining length of the lever arm 3 being thus sufficient to enable satisfactory accuracy to be obtained, even at the high points of the travel

of the float. The float 5, which is of flat shape, has great power for the control and, owing to the aforesaid flat shape, it can be readily passed, by holding it vertically, through the orifice of the tank, for assembling the whole arrangement.

The spindle 9 may actuate either a pointer which moves over a dial, or the slider of the potentiometer which will be described hereinafter, it being possible moreover to combine the two means with each other. On the base 1 is fixed, by means of screws 13, a case 14 containing the electrical members of the transmitter.

The said electrical members comprise a circular potentiometer 15, on the winding of which there moves a slider 16 secured to a rotary insulating plate 17 which is driven by the spindle 9 through the crank 11.

The slider 16, which is of the double brush type, moves, on the one hand on the winding 18 of the potentiometer 15, which winding is formed by an enamelled resistance wire 18 which is suitably bared (by filing) to permit of a good contact with the slider and is wound on a flat ring 19 made of insulating material, and on the other hand on a metal ring 20 which does not possess any substantial electrical resistance, said ring being fixed, by means of screws, on another ring 21 made of insulating material which is itself fixed on an externally screw-threaded ring 22 that serves, with the interposition of an insulating member 23, to clamp the potentiometer 15 in the bottom of the case 14 from which it is separated by an insulating disc 24. A screw 25 and its projection 26 prevent the parts 24, 15 and 23 from rotating when the ring 22 is screwed firmly home in the case 14 during assembly.

The plate 17 which carries the double brush 16 and into the recess 27 of which the crank-pin of the crank 11 penetrates, is secured to a bush 28 which is rotatable about a spindle 29 fixed to the case 14.

The ends of the wire 18 pass through the metal ring 22 in two insulating bushes 30 (Fig. 3) and are clamped in the slots of the terminals 31.

The circular contact ring 20 is connected to a conductor 32 which passes through an insulating bush 33 and is connected to the medial terminal 34 located between the terminals 31.

The three terminals 31 and 34 enable the wires extending to the receiver, which is placed at a distance, to be connected on the outside, the connections between the transmitter and the receiver being shown in the general electrical diagram of Fig. 14. The aforesaid terminals are prevented from rotating owing to the fact that they are provided with square portions 35 arranged in the corresponding square holes of an insulating plate 36. The external part of the terminals in question and the connections extending thereto are protected by a case 37 fixed to the box 14 by means of screws 38 and 25.

As shown in Figs. 1 to 4 in particular, the members which are associated with the case 14 form a separate electric apparatus which can be readily detached from (or connected to) the mechanical control float device associated with the base 1.

The electric apparatus and the mechanical device when connected to each other form a perfectly liquid-tight assembly owing to the plastic joint 39 placed between the base 1 and the case 14, to the semi-hard washers 40 placed under the heads of the screws 13 and to the insulating washers 41 clamped by the terminals 31 and 34.

In order to enable the satisfactory operation of

the apparatus to be checked before putting into use the tank to be gauged, each half of the double float 5 is provided with a special device which enables, on the one hand the tests for liquid-tightness to be effected, and on the other hand the float as a whole to be slid along the vertical guides 2 and the bent lever 3 which is placed between said guides. Said device, which is shown more particularly in Fig. 16, is composed of a kind of small tube 50 which is screw-threaded internally and soldered on the wall of the half-float 5, the end of the tube that communicates with the inside of the float being constricted relatively to the diameter of the screw-thread. After the tests for liquid-tightness of the float have been effected by means of the tube 50, a mass of lead 51 is introduced into said tube, a mass of plastic material 52 is superposed thereon and the whole is crushed by means of a screw 53. In the screw-thread portion that has remained free of the tube 50, there is screwed, for effecting the assembly, the end of a rod 54 which is sufficiently long to project, even when the float is at the bottom of its travel, outside a screw-threaded orifice provided in the support 1, which orifice is closed, when the apparatus is intended to be put into use, by means of a plug 55 carrying a column 56 which acts as a base for a braking washer clamped by the screw-threaded plug 57 of an inspection hole provided in the upper wall of said case. Another plug 58 is also screwed in the same end of the case 14 and enables the coupling between the pin of the crank 11 and the insulating plate 17 carrying the brush 16.

It is known that in gauging devices of the potentiometer type, the receiver is provided with two superposed coils which are arranged at right angles and apparently form a single block of attractive simplicity of construction, the angle of 90° formed between the two coils seemingly being in perfect harmony with the necessity for producing a resulting field acting on the magnetic armature.

Such systems however have various drawbacks.

In fact, since one of the coils is outside the other, each of them must be fairly flat and therefore of limited power, so that their distance from the movable soft iron armature must not be very different. If the power is increased by a greater width of winding, this quickly produces a fairly bulky arrangement owing to the orthogonal device, and the fixing in a receiving case becomes substantially impracticable. If, on the other hand, the power is increased by a greater thickness of winding, the effects of the coils are no longer identical for the same current, unless the power of the outer coil is slightly increased in order to provide compensation, but in that case the difficulty is encountered that there is no longer identical action in some cases and this gives rise to errors of indication. The mass of the superposed windings furthermore facilitates abnormal heating which impairs the efficient operation and the accuracy of the indicator.

The indicator-receiver constructed according to the present invention does not have the above mentioned drawbacks, but retains the advantages of the systems which have just been referred to.

As shown in Figs. 7 to 13, and more particularly in Figs. 9 and 10 which show a general view of a double receiver indicator mounted in one and the same case, that is to say an apparatus that enables two separate tanks to be gauged, each receiver is provided with two coils 60 and

61 which are arranged in the extension of each other and exert their opposing action on two blades 62 and 63 of the soft iron armature 64, the coils in question being fixed to each other so as to form a rectangular parallelepiped assembly that enables them to be firmly fixed to the case 65 by means of six screws 66 and 66'. Each screw 66' which is made of soft iron and is of predetermined length, acts, in addition to fixing the coils, as an auxiliary pole which exerts an additional attraction on the blades 62 and 63, in the extreme (maximum and minimum) position of said blades, which attraction enables the amplitude of the movement of the pointer 68 to be corrected, more sensitivity to be given the apparatus at the end of the travel (case of an empty tank for example) and finally all the apparatus of the same series to be adjusted to a standard dial made beforehand, this being effected according to the results obtained with the first apparatus of the series (three on each side).

This arrangement enables coils to be obtained which are powerful, identical and the heating of which is very slight.

This organization and arrangement of the coils furthermore enables, in case one of the coils is defective, such coil to be replaced without touching the other.

Owing to the fact that the system of blades 62 and 63 have to be perfectly balanced dynamically in particular in the case in which the device is used on vehicles are subjected to vibrations such as automobiles, motor launches, aeroplanes, rail coaches, etc. the blades in question form between them an angle of 120° and the dynamic balance referred to above is accurately obtained with a third blade 57 which is made of non-magnetic metal and is of the same shape as the other blades, but more or less thick according to the respective densities of the metals, and taking into account the weight of the pointer 68 which, although ultra-light, must obviously be compensated for.

It will immediately be seen that by means of the novel device, a very powerful, accurately balanced electrically and mechanically, and very rugged arrangement is obtained in a very simple manner. Of course, the shape of the magnetic blade and that of the compensating blade may vary according to the actions desired.

The power of the torque which acts on the blades is of fairly great importance owing to the presence of the pointer 68 whereof the mass, although very small, can only be theoretically perfectly balanced by means of an opposite mass

relatively to the pivotal axis, which mass is arranged fairly far to the rear, which would require a bulky case. Now, the effect of the mass of the pointer 68 will be more reduced as the resultant torque which acts on the blades 62 and 63 is greater.

The spindle of the movable system is adjustably mounted in a stirrup 69 (see Figs. 10 and 12) serving as a support for each of the two coils, the framework of which is formed by a flat tube 70 soldered to a flange 71 that comes into contact with the stirrup 69 on which it is fixed.

As stated above, the receiver which is shown by way of example in Figs. 7 to 11 is a double receiver indicator. In the case of large aeroplanes for example, in which the fuel tanks are often arranged in pairs, it is sufficient to have one double indicator, the case of which carries two graduated scales and a single row of figures (Fig. 7).

In the case of a single fuel tank and of a single oil reservoir, it is possible, as shown in Fig. 11, to graduate one of the scales for the fuel and the other for the oil.

The operation of the device which has just been described is substantially the same as that of the known potentiometer gauges. By the effect of the slider 16, the resistance 18 of the potentiometer 15 is divided in a ratio that depends on the position of the slider 16, that is to say on the position of the float 5, consequently on the quantity of liquid contained in the tank R to be gauged. The intensity of the current flowing through the coils 60 and 61 is in the same ratio, and the two fields produced by the two aforesaid coils are proportional to the intensities of the current flowing through said coils. In the position shown in Fig. 9, the attraction exerted by the coil 61 is greater than that exerted by the coil 60, but as the attraction effects decrease as the blades 62 and 63 move nearer to the geometrical centres of the coils, it follows that for each position of the slider 16 of the potentiometer there exists only one position of equilibrium of the blades of the receiver so that the index of the pointer 68 occupies quite a definite position on the graduated scale 15.

It is obvious that the embodiment of the remote reading electric indicator gauge described above and illustrated in the accompanying drawing is only given in an indicative and non-limitative manner and that the device in question could be subjected to any modifications of detail without departing from the spirit of the invention.

LUCIEN ALFRED MAURICE CORSET.



PUBLISHED

MAY 13, 1943

BY A. P. C.

L. A. M. CORSET

REMOTE READING ELECTRIC INDICATOR GAUGE

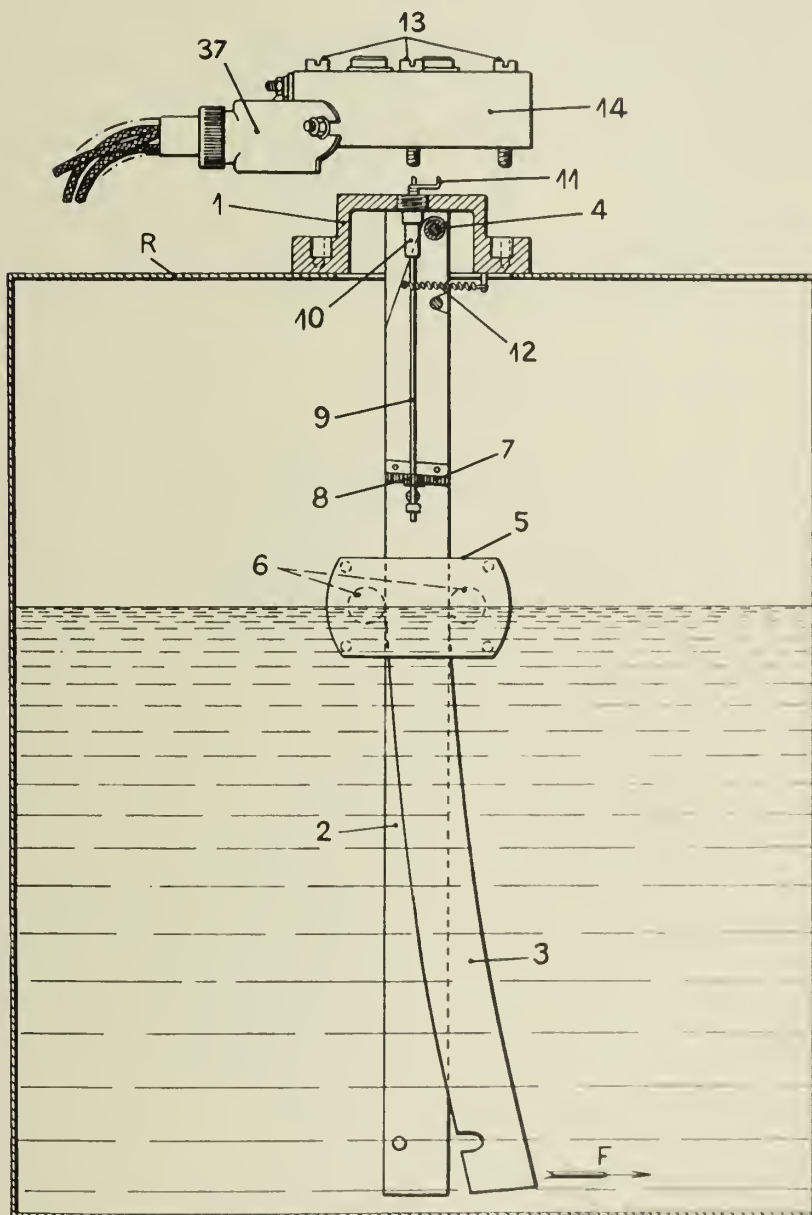
Filed Feb. 27, 1940

Serial No.

321,103

6 Sheets-Sheet 1

FIG. 1



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FIG. 2

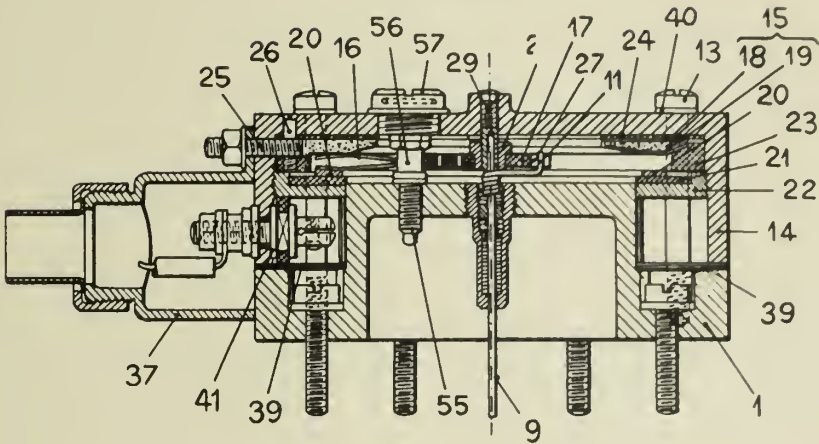


FIG. 3

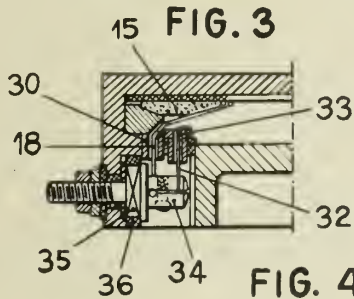
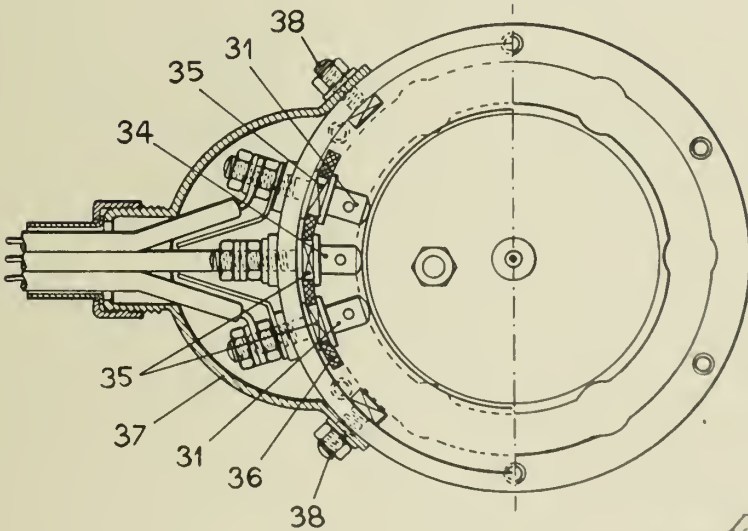


FIG. 4



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PUBLISHED

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REMOTE READING ELECTRIC INDICATOR GAUGE

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321,103

6 Sheets-Sheet 3

FIG. 5

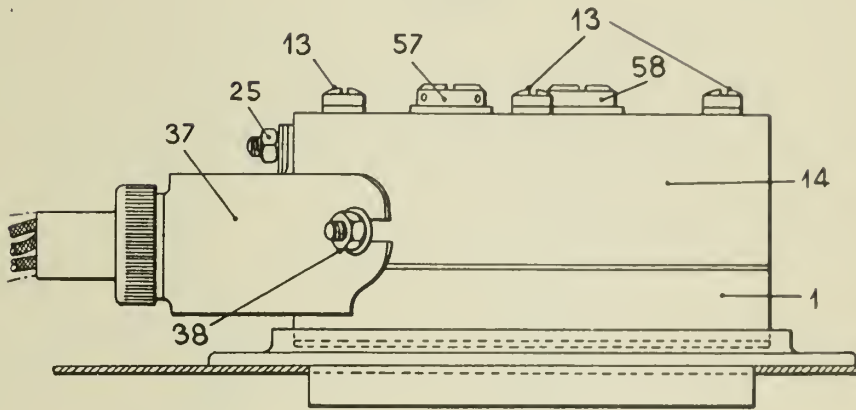
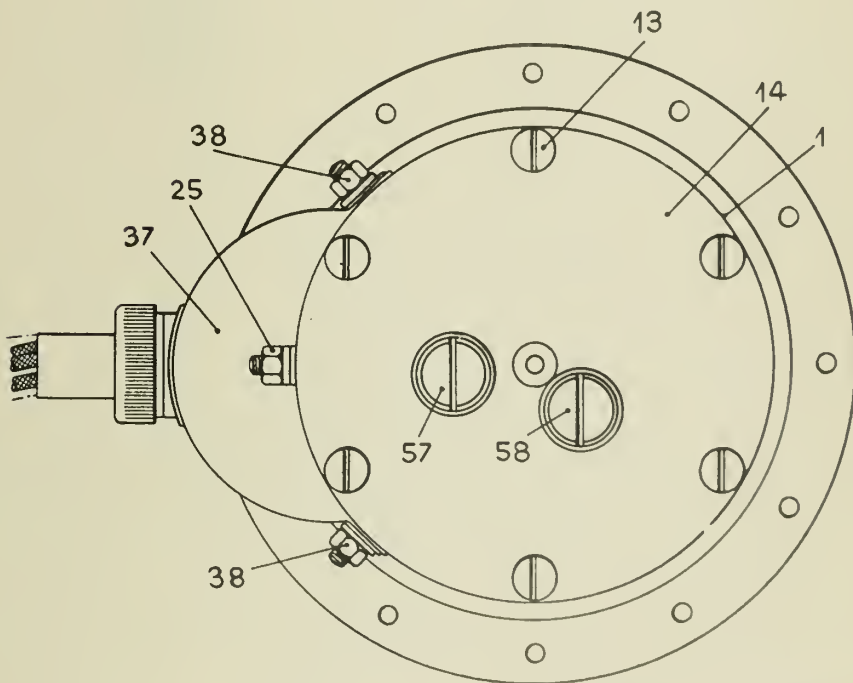


FIG. 6



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6 Sheets-Sheet 4

FIG. 8

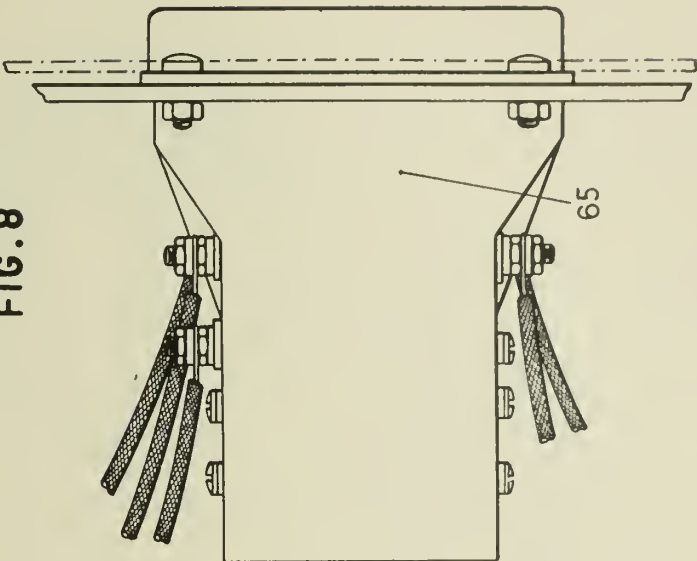
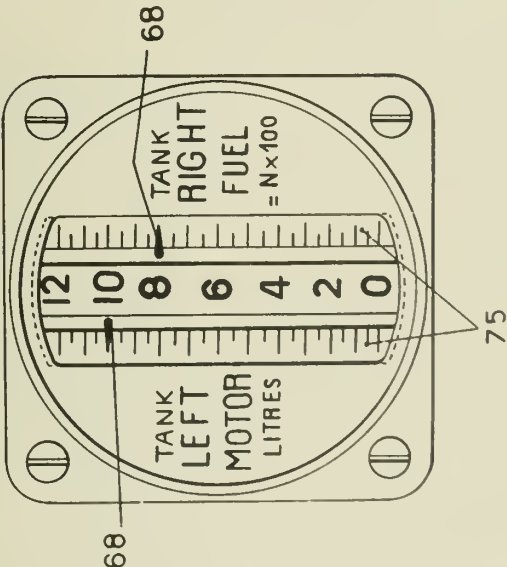


FIG. 7



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6 Sheets-Sheet 5

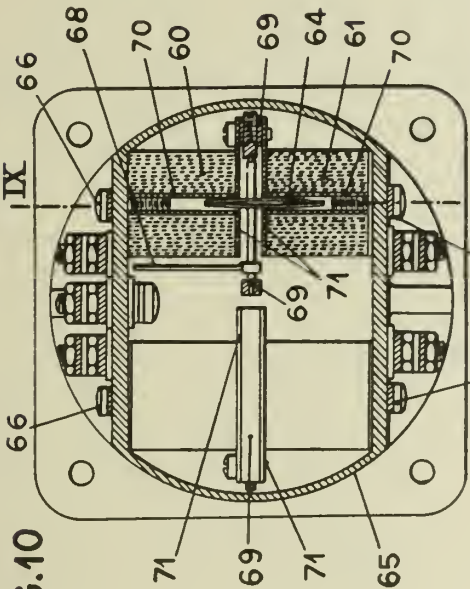


FIG. 9

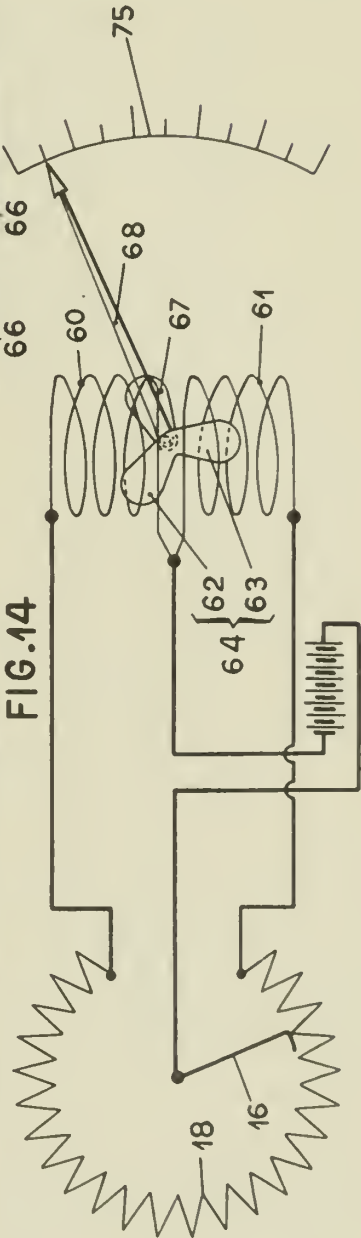
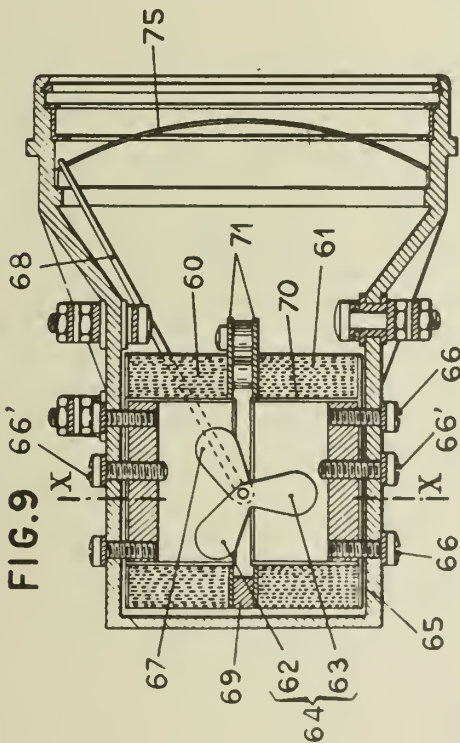


FIG. 14

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FIG. 11

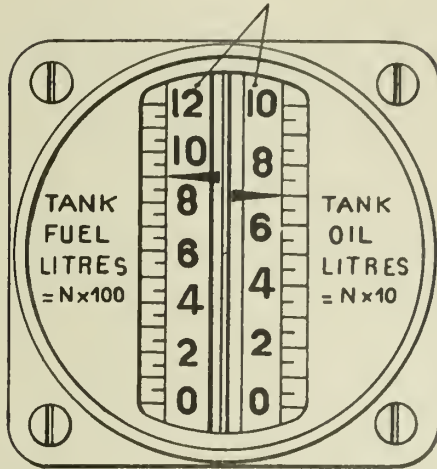


FIG. 12

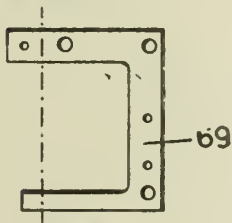


FIG. 13

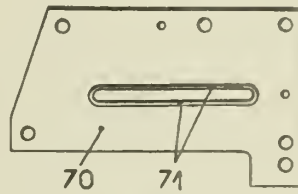


FIG. 15

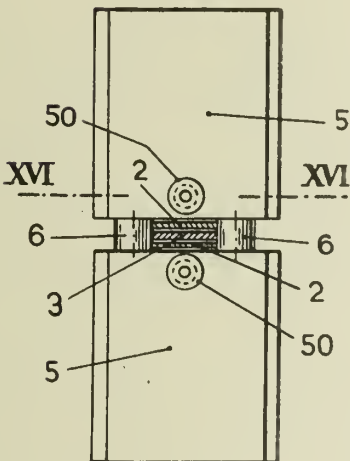
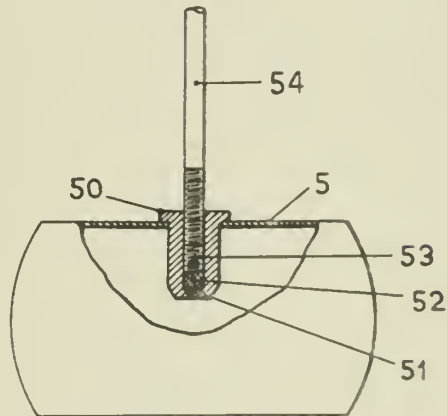


FIG. 16



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ALIEN PROPERTY CUSTODIAN

INSULATED ELECTRIC CONDUCTOR AND  
METHOD OF MAKING THE SAME

Johannes Hoekstra, Eindhoven, Holland; vested  
in the Alien Property Custodian

Application filed February 27, 1940

My invention relates to electric conductors having an insulating covering of textile material.

To protect such conductors against chemical and atmospheric influences it is well known to impregnate the textile covering with a wax-like or fat-like material, and although such materials generally satisfy electrical, chemical and mechanical conditions, they have the disadvantage that they are readily combustible. This increases the danger of fire already present due to the textile covering and is particularly disadvantageous when the insulated conductors are used in telephone stations or other places where a fire would cause great disturbance.

To overcome the above difficulty it has been proposed to impregnate the textile covering of a conductor with chlorinated naphthalines which, in addition to being chemically resistant and water repellent, make the textile fairly incombustible. However, the use of such chlorinated naphthalines has the disadvantage that they have a toxic effect on the human skin and respiratory system, which is, of course, a serious drawback in the manufacture and handling of such conductors.

The main object of my invention is to provide an impregnated textile coating which is durable, of good insulating properties, is chemical resistant and is non-combustible to a high degree, but which is obtained by using an impregnating material which is not toxic.

In accordance with the invention I impregnate the textile covering with a chlorinated rubber mass containing a quantity by weight of a suitable softener, preferably a fire-repellent softener, such as triphenylphosphate, tricresylphosphate or tributylphosphate, amounting to more than one third of the quantity of the mass.

The insulation of conductors having a textile covering impregnated with such a mass is sufficiently flexible that in working up there is no danger of damage, for instance, due to bending.

The chlorinated rubber is fire repellent to a high degree partly because it rapidly decomposes at temperatures above about 200° C. to give off incombustible gases which smother the flames.

If the impregnating mixtures according to the invention have a low viscosity at an elevated temperature, for instance at 70° C. to 120° C., the impregnation can be carried out at such temperatures without further means. However, if the viscosity of the mixture is too high at such temperatures to carry out the impregnation, I may dilute the same with a solvent, carry out the impregnation at room temperature and remove the solvent by drying.

To give the impregnating mixture according to the invention a viscosity which makes it suitable for the impregnation, I may start with a chlorinated rubber which itself has low viscosity. By the term "chlorinated rubber of low viscosity" is meant that a solution formed by dissolving two parts by weight of the rubber in eight parts by weight of toluene will have a low viscosity, for example below about 5 centipoise.

In order that the invention may be clearly understood and readily carried into effect, I shall describe the same in more detail with reference to the accompanying drawing in which the single figure is a sectionized perspective view of an insulated wire according to the invention.

The insulated wire shown in the drawing comprises a conductor 1, for instance of copper, provided with a textile covering 2, for instance of cloth or braid. In accordance with the invention the textile covering 2 is impregnated with a mixture of chlorinated rubber and a suitable softener.

The impregnating mixture may be formed by starting with 2.5 kgs. of a chlorinated rubber which when dissolved in about 10 parts by weight of toluene forms a solution having a viscosity of about 5 centipoise. This chlorinated rubber is mixed with 2 kgs. of tributylphosphate. Impregnation of the textile covering can be effected by passing the conductor with the textile covering thereon through a bath of the above impregnating mixture heated at a temperature of 80° C. The excess impregnating mixture can be removed from the covered wire by passing the same through a suitable nipple as it leaves the bath.

Alternatively the impregnating mass may be formed by mixing 2.8 kgs. of the above specified chlorinated rubber, 2 kgs. of tricresylphosphate, 1.8 kgs. of light gasoline and 0.45 kgs. of benzene. After the solution has clarified impregnation of the textile covering may be effected by passing the conductor with the textile covering through the above solution at room temperature, after which the solvent is removed by vaporisation.

Advantageously the impregnating mass may have added to it a quantity of mineral wax amounting less than a quarter of the mass, due to which it becomes opaque, the stickiness is decreased to a high extent and the whole gets the appearance and the consistency of a wax-like substance. Such an incombustible artificial wax-like material may, for instance, be formed by mixing 2.5 kgs. of the above chlorinated rubber, 2 kgs. of tricresylphosphate and 0.75 kgs. of ceresine. Impregnation may be effected at a temperature of about 100° C.

Although I have described my invention with reference to specific examples and applications, I do not desire to be limited thereto because obvious modifications will appear to one skilled in the art.

JOHANNES HOEKSTRA.



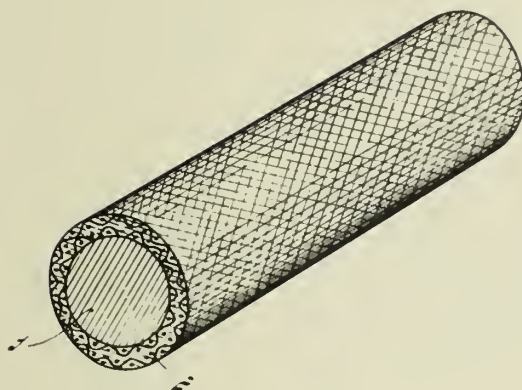
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BY A. P. C.

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INSULATED ELECTRIC CONDUCTOR AND  
METHOD OF MAKING THE SAME  
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321,131



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ALIEN PROPERTY CUSTODIAN

METHOD OF PRODUCING RIGID ELECTRIC WINDINGS

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No Drawing. Application filed February 28, 1940

In the production of electric coils or windings it is generally desirable that they should form a mechanically rigid assembly, it being frequently of importance that this effect should be attained even during winding so that there need be no fear of collapse.

According to the invention, this effect is obtained in a simple and inexpensive manner by arranging for adhesion of the parts of the wire to take place during winding, for which purpose a solution of adhesive is sprayed in a finely distributed form on the winding being formed, the solvent of the said solution quickly vaporising, preferably at room temperature.

According to one example the invention may be carried out as follows; an enamel wire is wound on a winding machine, if desired without using a spool bush or winding flanges, and during this winding the wound wire is sprayed, by means of a

spraying gun, with a fine "fog" of a solution constituted by 44 grams of chlorinated rubber and 11 grams of benzyl cellulose dissolved in a mixture of 200 cm<sup>3</sup> of methyl acetate, 200 cm<sup>3</sup> of acetone, 150 cm<sup>3</sup> of benzene, 50 cm<sup>3</sup> of toluene, 100 cm<sup>3</sup> of light gasoline and 200 cm<sup>3</sup> of ethyl ether.

After the winding is completed, the finished rigid product can be taken from the winding machine without any trouble.

The invention is of particular importance for the winding of coils for high-tension transformers, wherein it is often desirable that use should be made of coils having a very large external diameter and a small width.

The invention is further of particular importance for mass-production methods of forming coils.

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# ALIEN PROPERTY CUSTODIAN

## POROUS PARTITIONS FOR STORAGE BATTERIES AND ELECTRIC CELLS

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No Drawing. Application filed February 28, 1940

This invention relates to porous partitions for use in electric storage batteries to separate the electrodes of the same element. These partitions may vary greatly in shape according to circumstances, consisting, for example, of flat, or ribbed or undulated plates, or of containers or tubes of the Ironclad type of electrodes, containing the active material, etc.

These porous partitions are also used in cells, wherein they often have the shape of containers for an electrolyte or an agglomerate depolarizer.

It has already been proposed to make these partitions of clay, crockery or asbestos porcelain, but none of these has given complete satisfaction, either on account of insufficient porosity or because of obstruction of the pores during operation of the element or cell or for lack of sufficient resistance to the electrolyte.

The present invention overcomes these objections by providing porous partitions of any desired shape for use in electric cells and storage batteries, at least a part of which partitions is made of a novel porous material made up of grains of a suitable ceramic substance, heaped up and baked until said grains adhere to one another without deformation thereof.

Said novel material is particularly advantageous for making the partitions of the present invention owing to the fact that the grains may be made of a material that will not be attacked by the electrolyte and of a size that will provide any predetermined degree of porosity desired. The degree of porosity may thus be predeterminedly varied in different parts of the partition, a greater porosity being provided, for example, at or adjacent the surface of the partition than at the central portion thereof, by using grains of the required difference in size at the surface portion and at the central portion of said partition, respectively.

The grains used in accordance with my invention may be made entirely of any suitable self-enamelling ceramic paste or simply covered with such a paste, the adherence of said grains to one another being effected in either case by baking at the self-enamelling temperature.

My novel partition may be made in different ways. One convenient illustrative way is to pile up the grains in their raw state in a container of the shape it is desired to give to said partition

and the walls of which may or may not be porous or perforated, said container being itself preferably made of a self-enamelling ceramic paste or made of ceramic material coated with such a paste. On baking a porous ceramic partition will result which is welded to the walls of said container.

Another illustrative way of making partitions embodying my invention omits the use of a container, the mass of ceramic grains being moulded to the final shape desired, any suitable combustible plastic material being mixed therewith which is eliminated in the baking of said molded ceramic mass, thus leaving a porous ceramic partition in the final shape desired.

When a container is used it is only necessary to remove the bottom thereof in order to extract the finished partition.

I will now describe more in detail one of said illustrative ways of making partitions embodying my invention. Grains are made from a self-enamelling ceramic paste, the diameter of said grains being chosen according to the degree of porosity that it is desired the partition shall have. In general the diameter of the raw grains will be approximately 0.01 m. m. to 3 m. m. Said grains are preliminarily baked in a commercial furnace at a temperature of 1200° to 1300° C., after which said grains separate very readily. A plastic paste composed of said baked grains and a combustible binder, such as sulphated lignin or casein is then prepared and moulded to the desired shape, whereupon it is allowed to dry, care being taken that when dry the cohesion is excellent. The partition thus obtained is then baked at a temperature of about 1350° C. which is the self-enamelling temperature. This second baking may also be effected in an ordinary industrial furnace and upon its termination said binder will have completely disappeared and a partition embodying my invention and having the predetermined porosity and the shape desired will remain. The temperature need not be regulated with great precision, a temperature of from 1320° to 1380° C. giving good results. There need be no fear of deformation at these temperatures as said grains will not begin to soften at a temperature below 1450° C.

GUSTAVE LEQUERLER.



# ALIEN PROPERTY CUSTODIAN

## PIEZO-ELECTRIC DEVICE

Hans von Beckerath, Berlin, Germany; vested in  
the Alien Property Custodian

Application filed March 5, 1940

The invention relates to an oscillatory crystal, more especially to a quartz crystal which distinguishes itself by a high resonance resistance. The resonance resistance of an oscillation crystal, which depends on the damping of the crystal, is of a comparatively low ohmic order at the generally very low damping of the crystal, when considering one having the customary dimensions and the said ohmic value is a definite one. For many purposes of use such a value of the resonance resistance is disadvantageous, and for this reason the desire exists of operating with a higher resonance resistance. For instance, when using a crystal in a return coupled oscillatory circuit, a comparatively low-ohmic oscillatory crystal operates often in a very unfavorable manner. Such oscillation circuits are usually so designed to advantage that a feed-back of pure phase is obtained, and that the quartz crystal oscillates exactly in its longitudinal resonance, which is possible between real values in a voltage divider circuit. The resonance resistance is to be hereby of the same order, and possibly of higher order, than the other resistances in order to maintain a low total damping in the feed-back path. In order to obtain the required feed-back potential, there is required a certain value for the resonance resistance at a given maximum crystal load (current density). Owing to the very low damping of the quartz crystal, the resonance resistance is often too low for the described purpose of use. This disadvantage can be avoided by the use of an oscillation crystal, in accordance with the invention in which without changing the frequency any desired higher resonance resistance can be obtained.

In the oscillation crystal, according to the invention, at least on one of the surfaces provided with electrodes, the electrode layers are separated into parts insulated from one another. Then, at least one of the parts, insulated from the other electrode parts situated on the same crystal surface, is connected with an electrode which lies opposite the said part on the opposite crystal surface. The oscillatory crystal, in accordance with the invention, is to be conceived as a crystal transformer having two electrode pairs whereby the secondary electrodes are short-circuited, while the one secondary electrode can form a coherent layer with the primary electrode situated on the same crystal surface. In view of the fact that in the oscillation crystal, according to the invention, a part of the layers is short-circuited, any desired higher resonance resistance can be obtained by way of resistance transformation. This fact can be proven on the basis of the following deliberations in reference to the attached drawing.

In the scheme shown in Fig. 1, for instance, the surface 1 represents the oscillating front face

of a crystal rod. Item  $b_1$  designates the width of the primary layer, and  $b_2$  is that of the secondary layer, whereby  $b_1 + b_2 = b$  is the total width. Item  $c_1$  be the static capacity of the primary side of the crystal inclusive the capacity of the leads, item  $c_2$  be the static capacity of the secondary side inclusive any connected capacity. Item  $c_k$  be the coupling capacity between the two layers. The inner resistance of the generator be negligibly small as compared with the other apparent resistances.

Owing to the rigid current ratio

$$\frac{i_1}{i_2} = \frac{b_1}{b_2}$$

which is independent of the frequency, a substitution scheme must be obtained which is similar to the completely covered crystal. The substitution scheme for the fully covered quartz crystal (index 0) consists, as is known, of a series connection of the values  $L_0$ ,  $C_0$ ,  $R_0$  to which the static capacity  $C_p$  lies in parallel. Then  $i_0$  is the current of the piezo-electric crystal for the fully covered crystal, if at the same frequency it produces the same oscillation amplitude as in the case of the subdivided layers.

Now, in order to ascertain the substitution quantities  $L$ ,  $C$ ,  $R$ , which correspond to the quantities  $L_0$ ,  $C_0$ ,  $R_0$  of a completely covered crystal, there is introduced a transformation ratio similarly to the case of the transformer, namely:

$$u = \frac{b_2}{b_1}$$

Hence the equation exists:

$$\frac{i_0}{b_1 + b_2} = \frac{i_1}{b_1} = \frac{i_2}{b_2}$$

$$i_2 = u \cdot i_1$$

$$i_0 = (1 + u) i_1 = \left(1 + \frac{1}{u}\right) i_2$$

When causing the crystal to oscillate, the currents  $i_1$  and  $i_2$  flow. Owing to  $i_1$  and  $i_2$  having the same phase all currents indicated in Fig. 1 have the same phase. The current flowing through the generator is expressed as follows:

$$i_3 = i_1 + i_2$$

$$i^4 = i_2 \frac{c_k}{c_2 + c_k}$$

$$i_3 = i_1 + i_2 \frac{c_k}{c_2 + c_k} = i_1 \left(1 + u \frac{c_k}{c_2 + c_k}\right) = i_0 \left(\frac{1}{1 + u}\right) \left(1 + u \frac{c_k}{c_2 + c_k}\right)$$

If  $c_k$  and  $c_2$  are assumed to be free from losses, the effective power supplied by the generator

is to be equal to the loss power of the fully covered crystal.

$$i_3^2 R = i_o^2 R_o$$

In view of the fact that in both cases the oscillating mass performs the same movement, also all the apparent powers must be equal:

$$i_3^2 \omega L = i_o^2 \omega L_o$$

The capacitive apparent power is higher as compared with that of the fully covered quartz crystal, since the current  $i_2$  passes through the capacities  $c_k$  and  $c_2$ , hence:

$$\frac{i_2^2}{\omega c} = \frac{i_o^2}{\omega c_o} + \frac{i_2^2}{\omega(c_2 + c_k)}$$

It follows, therefore, that:

$$R = R_o \left( \frac{1+u}{1+u \frac{c_k}{c_2 + c_k}} \right)^2$$

$$L = L_o \left( \frac{1+u}{1+u \frac{c_k}{c_2 + c_k}} \right)^2$$

$$C = C_o \left( \frac{1+u \frac{c_k}{c_2 + c_k}}{1+u} \right)^2 \cdot \frac{c_2 + c_k}{C_o \left( 1 + \frac{1}{u} \right)^2 + C_2 + C_k}$$

$$C_v = C_1 + \frac{c_2 \cdot c_k}{c_2 + c_k}$$

Now, if the secondary side is short-circuited there is  $c_2 = \infty$

$$R = R_o \cdot (1+u)^2$$

$$L = L_o \cdot (1+u)^2$$

$$C = C_o \cdot \frac{1}{(1+u)^2}$$

Hence, only as regards resistance does the crystal appear to be transformed upwards in the ratio  $(1+u)^2$  without a frequency variation being thereby entailed. In a rod-shaped crystal according to the figure which oscillates longitudinally the transformation ratio is the proportion between the widths of the layers and, generally speaking, it is the proportion between the surfaces which are proportional to the piezo-electric charges. The derived formulas are correct in the same degree also in plate crystals or in other crystal shapes which carry out oscillations in the thickness thereof. But it is hereby presupposed that the entire surface represents a wave front. The quantity  $u$  would then be the ratio between the surfaces of the separated layers.

In a numerical example the resistance transformation can be clearly illustrated. Thus, in a rod-shaped quartz crystal having the dimensions 27 x 12 x 1.5 mm, and at a resonance frequency of 100 kc. in the fully covered state, the impedance is found to be  $Z_o = \omega L_o = 2.5 \cdot 10^7$  ohm. When assuming a quality value equal to

$$Q = \frac{\omega L_o}{R_o} = 2.10^5$$

then the value  $R_o$  equals 125 ohm. Now, if the layer of such a crystal is divided up and the transformation ratio  $u=3$  is chosen, then there is  $b_2=9$  mm and  $b_1=3$  mm. In this case there is:

$$Z = Z_o \cdot (1+u)^2 = 4.10^3 \text{ ohm}$$

$$R = R_o \cdot (1+u)^2 = 2000 \text{ ohm}$$

When producing a crystal in accordance with the invention the steps may be as follows: The crystal is next provided with a complete layer and then by milling a groove parallel to the longitudinal edge, the metal layer of a surface is divided into two parts insulated from one another. The layer of the one partial surface is then suitably passed around the quartz crystal so that it is in a direct conductive connection with the undivided layer on the opposite crystal surface.

An example of construction of such a crystal is shown in Fig. 2. On the surface on top of the crystal 1 the layer 2 is insulated from the partial layer 3. The layer 3 is connected with the layer 5 arranged on the bottom surface of the crystal, whereby the said connection is provided through a layer 4 which is situated on the side face of the crystal. In the case of a longitudinally oscillating rod the separating line between the layers 2 and 3 extends preferably parallel to the edge whose length determines the frequency. In the example of construction shown, the transformation ratio is greater than 1. Hence, the separating line comes to lie on the left half of the crystal so that the mounting place, which is at the same time also the place for the current supply line, is situated in a region which can be assigned, by passing around the separating line, to the narrow electrode strip. Then the connections are, on the one hand, at the electrode layer 2, and on the other hand, at the electrode layer 5.

Fig. 3 shows a further example of construction in which the crystal oscillates in a higher harmonic. The crystal then oscillates, for instance, in the third harmonic. By means of a corresponding adaptation of the separating line between the electrode layers 2 and 3 there is likewise produced a crystal with a resistance transformation.

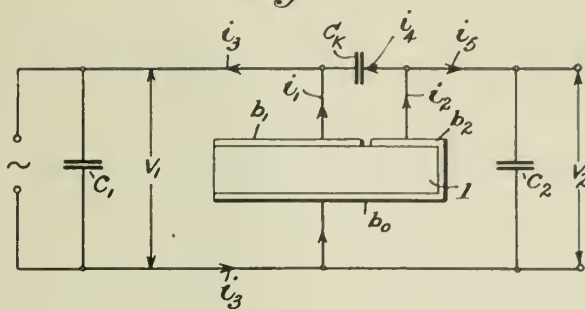
HANS VON BECKERATH.

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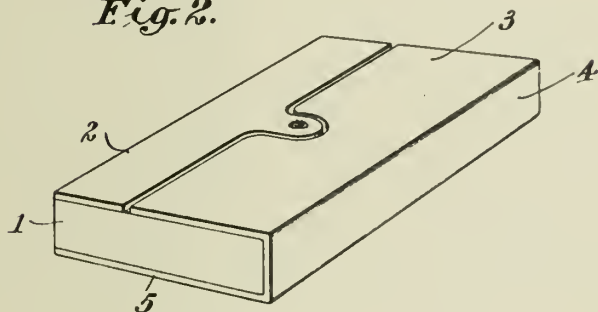
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PIEZO-ELECTRIC DEVICE  
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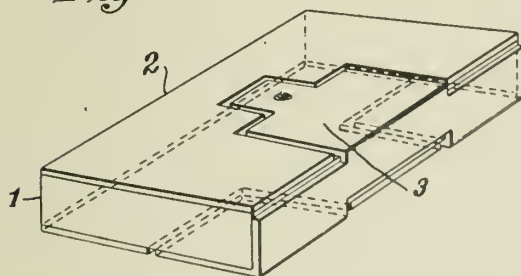
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



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# ALIEN PROPERTY CUSTODIAN

## VIBRATORY SYSTEM

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Alien Property Custodian

Application filed March 6, 1940

Contacts operated at high rates of speed of the kind used principally in vibrators, that is, vibratory inverters and rectifiers or choppers, two properties are extremely desirable, namely, high conducting power and high thermal stability of the contact. These two properties cannot be combined and united in practice since a material having a high electric conductivity and possessing at the same time when used as a contact pole a low contact resistance at the contact point proper (as a result of the high conductivity of the oxide skins or films etc. forming on the surface) as is true, for instance, of silver, has a very low thermal stability or refractoriness, while, inversely, a material having high thermal stability or refractoriness such as tungsten carbide has both, inherently, a high resistance as well as when employed as a contact a high contact resistance.

Now, according to the invention two paralleled and jointly actuatable contacts are employed. One of these contacts is built from the viewpoint to insure a high electrical conductivity and/or contact conductivity (or low contact resistance), while the other contact is designed from the viewpoint to insure and possess a high temperature or thermal stability or refractoriness.

An exemplified embodiment of the invention is shown in the drawing as applied to a vibrator or vibratory make and break. The vibrating spring, blade or reed 1 of the device, in addition to the exciting contact 2, carries upon each face contact poles 4, 6, 8 and 10. Each of the two cooperative springs 11 and 12, in turn, supports two contact poles 3 and 9, and 5 and 7 respectively. Of these contact poles, those poles which cooperate with one another, that is, 3, 4, 5 and 6 consist of sintered or concreted tungsten carbide or the like to act as a binding or bonding means, or the like. The other contact poles which cooperate, that is, 7, 8, 9 and 10 are made of pure silver or else a silver-tungsten or silver-palladium alloy.

While the inter-contact distances or gaps originally are equal, a marked wear and tear of the silver contacts will first be noticeable in actual operation of the device. As a consequence, the inter-contact distance and thus the

opening times of the silver contacts will grow. The result in practice is that first the tungsten contacts and only slightly later the silver contacts are closed, while, inversely, first the silver contacts and then only the tungsten contacts will be opened. In other words, the work of opening and closing of the working circuit practically speaking is carried only by the tungsten contacts with the result that no sparking will happen at the silver contacts, thus precluding the chance of additional wear and tear. The silver contacts, on the other hand, during the major part of the closing period, will take care chiefly of the conduction of the working current so that the aggregate contact resistance of the contact assembly is low, with the result that the contacts will become but little heated as a result of heat dissipated by current flow.

If in the course of time also the gap of the tungsten contacts should diminish as a result of wear, this spontaneously will result in a so much faster increase in the distance between the silver contacts. In other words, the conditions before described will always be restored automatically, as it were.

In lieu of the silver contacts, recourse could be had also to other rare metal contacts, say, gold or platinum contacts. In certain circumstances it may also suffice to use in lieu of platinum contact poles of some other metal which are coated or plated with tenuous contact platelets of platinum (platinizing) instead of contact poles made of solid platinum. To be sure, the thickness of this platinum plating must be so heavy that even after an initially stronger wear and tear by heat action, a little platinum will be left; or else the contact spacing from the outset must be chosen so much greater than the contact spacing of those contacts which have been designed for greater temperature stability or refractoriness that sparks will be produced only at the latter contacts.

The contact possessing great thermal stability could also be made of a metal possessing a higher fusion temperature such as tungsten or palladium instead of consisting of a hard metal carbide.

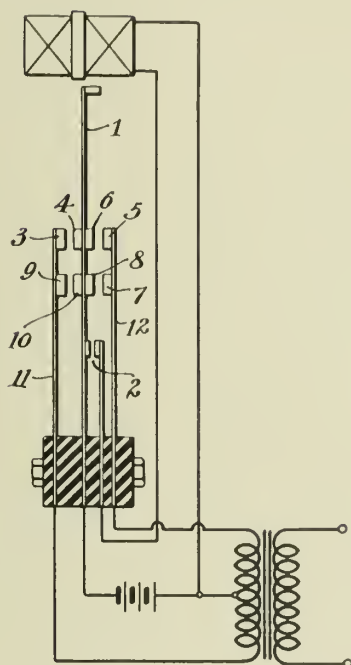
ALFRED LEIFER



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A. LEIFER  
VIBRATORY SYSTEM  
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# ALIEN PROPERTY CUSTODIAN

## ELECTRO-MAGNETIC CLUTCHES

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Application filed March 6, 1940

Our invention relates to electromagnetic clutches and has special reference to the discs used therein.

Such discs have to be very thin so that a plurality of them may be used in one clutch of the electromagnetic type. Some of these discs are in driving connection with an interior part and some with an exterior part. The clutching effect is obtained by pressing the discs together. For this purpose there is an exciting electric coil on one side of the succession of discs and an armature disc or plate at the other side thereof. It has become usual to provide apertures in such discs in the zone opposite to the stimulating electric coil.

Such discs when in use are subject to great heat development from the inner parts of the clutch, the outer parts suffering not so much therefrom. Consequently, there are forces tending to expand the inner portions to a higher degree than the outer portions. This results in the discs becoming sinuous or dished, as the inner portions cannot yield, and causes a greater distance between the individual discs in the axial direction which again results in a greater force being necessary to cause engagement of the clutch. When becoming cool again the inner portions shrinking tend to force the outer portions to a reduction in diameter which again causes the discs, in this case especially the outer portions, to become sinuous or otherwise misshaped, so that the discs will still be in frictional touch even after the clutch having been released.

Our invention avoids all these drawbacks by providing slits in the discs, such slits extending from the inner portion to the middle portion and also from the outer portion to the middle portion. Preferably, with the discs being in driving connection with an exterior part the slits in the inner portion should meet with the apertures afore-mentioned, whereas with the discs being in driving connection with an interior part the slits in the outer portion should meet with these apertures. In this manner the discs will be subdivided by substantially radially extending slits into a number of individual sector-like or segment-like portions which may expand at ease because of heat being created in the clutch on its operation, without warping or becoming sinuous.

Having given a general description of our invention we now want to point it out more in detail having reference to the drawings which represent several examples embodying our invention.

Fig. 1 is a side view, partly in section on an electromagnetic clutch.

Fig. 2 is a vertical section taken on line II—II of Fig. 1.

Figs. 3 and 4 are plan views on outer and inner guided discs, respectively.

Figs. 5 and 6 are like views but showing differently drawn slits in the discs.

Shaft 1 is surrounded by a bush 2 on which pinion 3 is loosely journaled. Magnet body 4 is keyed to said pinion 3. Enclosed therein is the exciting coil 5 and on its circumference sliding ring 6 is seated in the isolating mass 7. There is a connecting wire 8 from said coil 5 to said sliding ring 6.

Opposite to coil 5 the clutch discs 10, 14 are situated. They are extremely thin and a number of them (10) by means of teeth 11 are in driving connection with outer claws 12 belonging to the magnet body 4 and another number (14) are in driving connection with shaft 1 by means of projecting teeth 15 and grooves 16 or the like. These different clutch discs are arranged in alternating sequence, as usual. There is an armature disc 17 situated at the left hand end of the sequence of discs 10, 14; this armature disc is in driving connection with shaft 1.

All of the discs are axially displaceable. They have apertures 18 in the ring zone opposite to coil 5 leaving intermediate connecting studs 19. With the discs (10) which are in outer driving connection, as represented in Fig. 3, there are slits 20 extending from the outer circumference to said studs 19 and other slits 21 extending from the inner edge to the apertures 18. In contradistinction thereto the discs (14) being in inner driving connection (Fig. 4) have slits 25 extending from the inner toothed edge towards said studs 19 and other slits 24 extending from the outer circumference to the apertures 18. Slits 24 may extend even further, for example to limiting circle 40 shown in dashed lines in Fig. 4, and slits 25 may end also at this circle 40.

But, as represented in Figs. 5 and 6, both, the outer slits 20 and the inner slits 25 may extend even beyond such limiting circles and they may have at their ends circular enlargements 30 and 35, respectively.

The sector- or segment-like subdivision of the discs is more clearly demonstrated in Figs. 3 and 4 in which the wing-shaped plane portions are marked in dotted lines.

We do not want to be limited to the details described or shown in the drawings, as many variations may occur to those skilled in the art without deviating from the scope of our invention.

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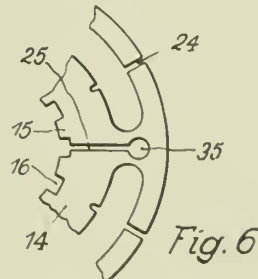
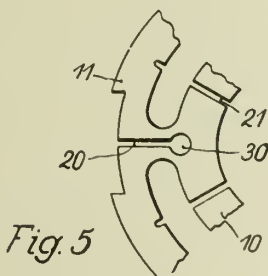
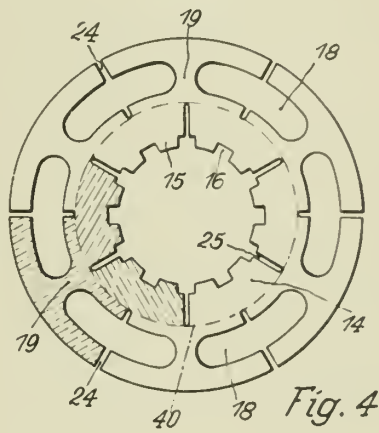
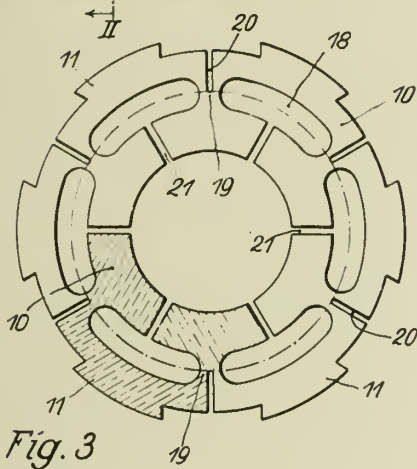
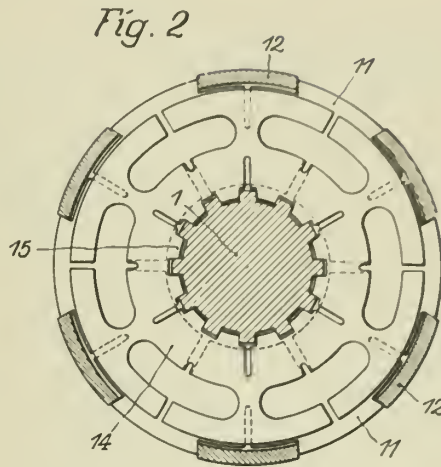
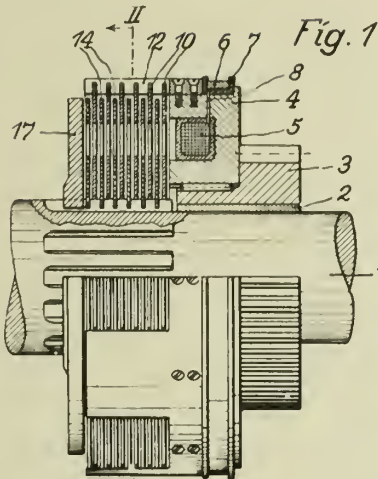
A. MAIER ET AL

ELECTRO-MAGNETIC CLUTCHES

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INVENTOR

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BY *Albert Meier*  
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# ALIEN PROPERTY CUSTODIAN

## TESTING DEVICES

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Application filed March 9, 1940

This invention relates to a device for testing the ground connection of electrical machines and apparatus, particularly of the movable type, as ramming tools, vibrators, hammers, drilling machines, grinders, wood working tools, sprayers, scrapers, generators, current generating plants, milling machines, etc., and can be advantageously applied wherever electrical machines and implements are connected to a main line by conductors of greater length.

It is known to provide electrical machines which through defects in the machines themselves or in the current supply expose operators to the danger of being subjected to the action of current carrying parts with protective grounding connections which, however, are also liable to become defective and thereby useless.

It is further known to provide electrical machines and implements involving the possibility of body contact with a disconnecting switch which acts automatically prior to the development of a contact potential of undue magnitude, approximately 22 volts. The reliability of such an arrangement presupposes of course that the grounding wire from the machine to the switch and from the latter to the auxiliary ground is in perfect order. It has not been possible hitherto to test both sections of the grounding wire, since the test key of the disconnecting switch passes only an artificial current to the auxiliary ground and, if the latter is in good condition, causes response of the switch, so that only the portion of the grounding wire disposed between the disconnecting switch and the ground can be tested. The provision of grounding connections is, on the other hand, of value only if the portion of the grounding wire leading from the machine to the disconnecting switch is in proper order also. This applies particularly to movable machines and implements. Experience has shown that in numerous instances, as in building yards, etc., it is sometimes difficult to procure a test lamp for inspection of the grounding connection or frequent testing is omitted out of indolence.

It is the object of the invention to enable an operator to test the grounding connection at any time while remaining at his place. For this purpose the machine or implement is fitted with a device which permits testing of the grounding wire from the metal parts to the earth during operation without requiring to leave the machine or to drop the implement. This arrangement is of considerable importance to various lines of work.

The invention may be carried out in various ways, but always involves the provision of a testing device within range of the machine, etc., by means of which an artificial earth current can be passed from the metal parts of a machine through the movable grounding wire and the trip coil of the switch to the auxiliary ground and the disconnecting switch can be made to respond if the grounding wire is in order. In this way the entire grounding connection may be tested at any time and in any desired order. The testing device may be disposed directly on the machine, etc. or installed in the motor frame or switch case thereof.

As in most cases the disconnecting switch is suspended at some distance from the machine or implement to be protected, it would be necessary to walk to the switch and to turn it on again after each test, which would be troublesome and interfere with frequent testing, particularly in case of movable grounding connections. The invention provides therefore within range of the disconnecting switch electrical or mechanical means which after interruption of the artificial earth current automatically return the disconnecting switch into operative position. It is further possible to additionally provide the machine, etc. itself in known manner with a remote control switch for actuating the disconnecting switch, or to arrange the disconnecting switch in the casing of the machine within reach of the operator and thereby to dispense with the necessity of installing additional and expensive remote control means. The disconnecting switch can be protected against harmful vibration by suitable means, as metals, rubber, springs, air cushions, etc.

It is further advisable to protect the contact-making parts of the switch and control means against the action of foreign magnetic fields or to screen them.

Four embodiments of the invention are illustrated in the accompanying drawings, in which Figure 1 shows the simplest arrangement;

Fig. 2, a construction connected with the disconnecting switch for automatically switching it on again;

Fig. 3, a remote control switch operating from the machine to the disconnecting switch;

Fig. 4, another embodiment with in-built disconnecting switch and two- or three-conductor cord; and

Fig. 5, a special form of a movable current generator.

1 is a network with the fuses 2. 3 is the

main switch. In the current supply a disconnecting switch of known type is arranged. 5 is a socket and 6 a working implement. 7 is the grounding wire and 8 the earth. In the embodiment shown the testing device is installed in the casing of the implement 6 and comprises a key 9 having a cushioned bow 10 and a connection 11 connected to the wire 7. The grounding wire 7 is passed through a testing device of known kind disposed within range of the disconnecting switch 4. 12 designates a switching means for turning the disconnecting switch 4 on again.

In the construction shown in Fig. 4 the current supply reaches up to the implement 6, the testing device and the disconnecting switch being installed in the casing of the implement 6. The testing device comprises a key 9 with a cushioned bow 10 and a connection 11 connected to the grounding wire 7 which is passed again through a testing device of known type arranged within range of the disconnecting switch 4. The switch 4 and its re-starting switch 12 are installed in the casing 6 or within range thereof.

The device functions as follows:

At the actuation of the testing device 9, 10 and after disconnection of the machine or implement an earth current is conducted through resistances from one or the other current carrying part through the connection 11 to the grounding wire 7, whereby the disconnecting switch 4 is opened. The operator knows now that the line 7 is in order. By actuating the switch 12 the disconnecting switch 4 is returned to operative position.

In the embodiment shown in Fig. 2 the ar-

rangement is such that the grounding wire 7 is passed through a coil 13. The coil has an armature 14 carrying a contact plate 15. 16 is a pressure spring. When an artificial earth current is conducted through the grounding wire 7 by actuating the testing device 9, 10 disposed on the implement, the contact plate 15 is drawn away from the armature 14 against the action of the spring 16 and the disconnecting switch 4 is opened. When the current in the grounding wire 7 is interrupted again, the contact plate 15, due to the action of the spring 16, returns to initial position and connects two contacts 17, 18, so that a circuit through a coil 19 is closed and the switch 4 is switched on again and the implement 6 is supplied with current. In this construction the switch 4 is therefore automatically switched on again by interruption of the artificial earth current in the wire 7.

The arrangement shown in Fig. 3 is similar to that of Fig. 2, with the difference, however, that a remote control switch formed of the lines 20 and a contact 21 is provided. Only after actuation of the contact 21 on the implement 6 and interruption of the artificial grounding current in the wire 7 the coil 19 is excited and causes closing of the disconnecting switch 4 which in this instance serves also as actuating switch.

The casing of the implement 6 or the entire plant may be provided with an additional known switching means. The devices described may be arranged on both movable and fixed electrical machines and implements of any type.

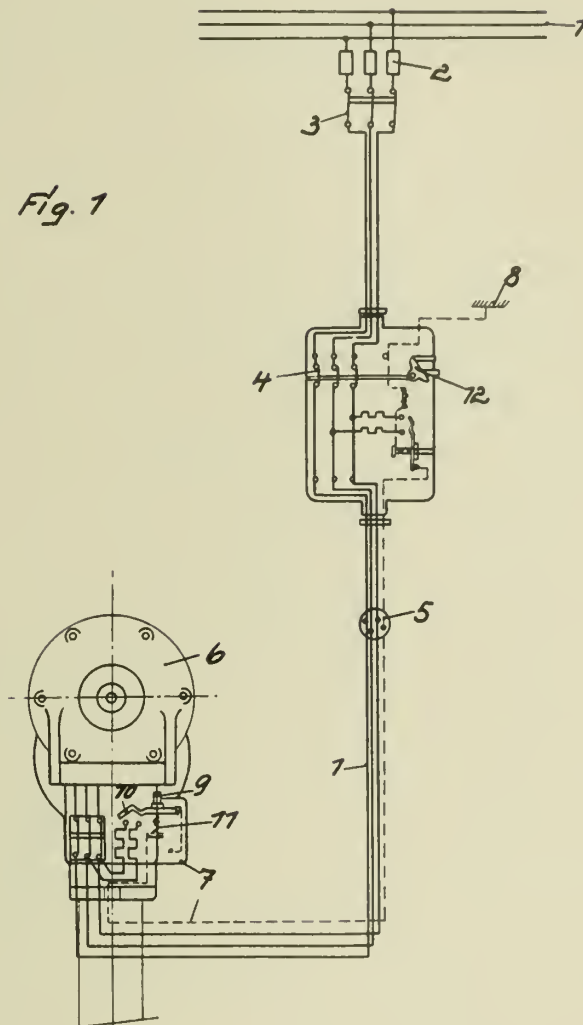
MARTIN BÖCKLER.

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M. BÖCKLER  
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4 Sheets-Sheet 1

*Fig. 1*



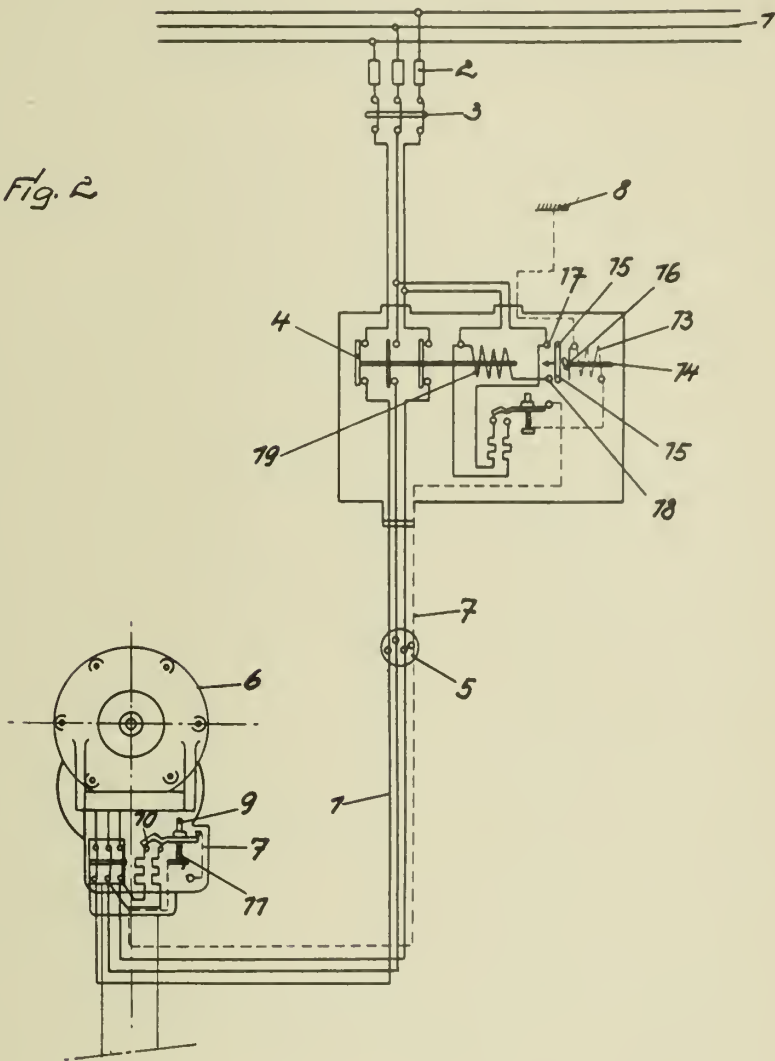
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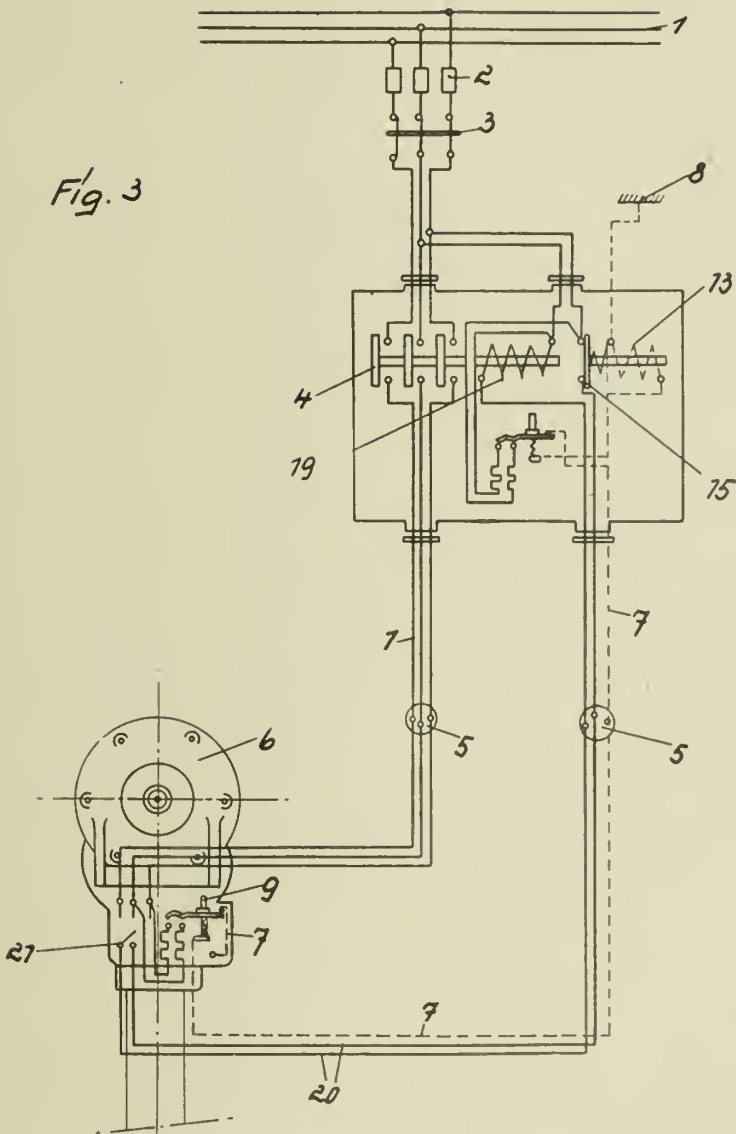
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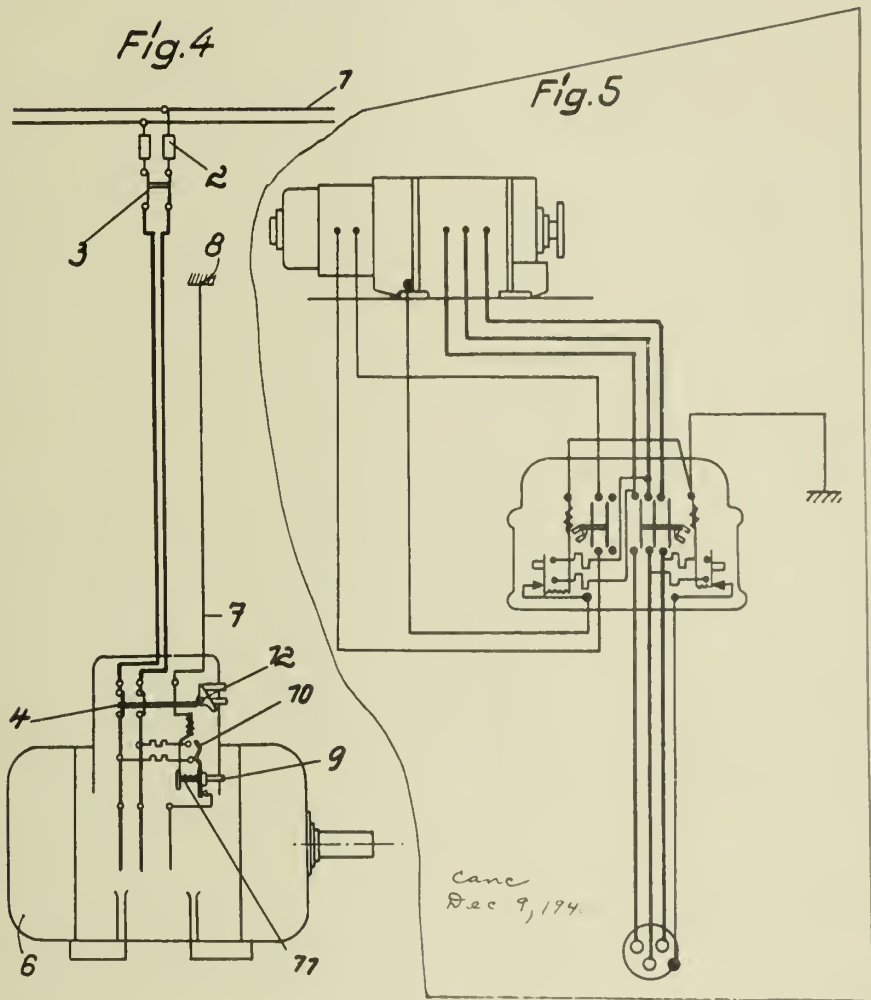
TESTING DEVICES

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4 Sheets-Sheet 4



Inventor:  
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# ALIEN PROPERTY CUSTODIAN

## PROCESS FOR THE PRODUCTION OF UNSATURATED KETONALCOHOLS OF THE CYCLOPENTANO - POLYHIDRO - PHENANTRENE SERIES

Andreas Krámlí and László Vargha, Budapest, Hungary; vested in the Alien Property Custodian

No Drawing. Application filed March 9, 1940

According to the known process for the production of unsaturated ketonalkohols of the cyclopentano - polyhidro - phenantrene series the final product is obtained by several steps, thorough several intermediate products, using diketones as starting material. This process shows the disadvantage to be complicated and to bring forth but an insufficient output. The biochemical process of Mamoli and Vercellone (Ber. d. D. Chem. Ges. 70, 470, 1937) shows the drawback of the necessitate use of large quantities of materials and needs therefore vessels of considerable volume.

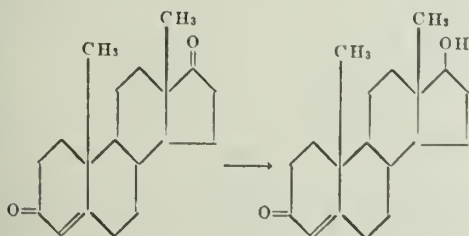
By the process according to the invention unsaturated ketonalkohols of the cyclopentano - polyhidro - phenantrene series can be obtained in a single step by subjecting the unsaturated polyketones of that series to reduction by electrolysis. A considerable advantage thereat is the quick and easily regulated electrochemical process and the simple way of the separation of the products.

The electrolysis is carried out by the use of a diaphragm and preferably with ethyl alcohol or any organic solvent miscible with water. Further it is advantageous to use in the electrolysis the multiple quantity of electric current as calculated theoretically.

If non-electrolyte solvents are used, an electrolyte is to be dissolved therein. For this purpose sodium acetate in ethyl alcohol, glacial acetic acid in hydrochloric acid and the like can be used. The cathode consists preferably of lead, nickel, copper, carbon or platinum. The temperature of the cathode-room is kept during the electrolysis preferably between 40 to 80° C. and the material therein is permanently stirred. The surface density of current on the cathode is preferably 1 to 4 amp/dm<sup>2</sup>.

If one of the diketones of the said series have been used as starting material for the electrolysis only one of their keto-groups becomes reduced, the present unsaturated junction of the compound remaining thereat undisturbed.

The following formulae show the process in question:



### Example

2,5 grammes of  $\Delta^4$ -androstendion-(3,17) are dissolved in a 5% solution of sodium acetate and subjected to electrolysis between a cathode of lead arranged in a diaphragm of clay and a sheet shaped anode of lead placed in a 5% solution of sodium acetate. The temperature of the cathode-room is kept between 55 and 60° C. and the catholite is stirred during the electrolysis. The surface density of the current amounts 2 to 3 amp/dm<sup>2</sup> on the cathode, the three- to four-fold quantity of current passing the cell during the electrolysis as calculated theoretically. After ending of the electrolysis the catholite is evaporated up to a volume of 30 to 40 cm<sup>3</sup>, the remainder is diluted with water to the threefold volume and left to stand for several hours. The crystalline solid fallen out is filtered, several times washed with water and dried. The dry material is dissolved in 20 cm<sup>3</sup> of hot methanol and left overnight. The small quantity of testosterone C (m. p. 222° C.) crystallizing out from the solution is separated by filtration, the solution is evaporated up to a small volume and the crystallized testosterone T is collected as main product, washed with a small quantity of ether and dried. A further purification of the product can be carried out by re-crystallization from hot benzene. The product shows a melting point of 153° C.

If from  $\Delta^4$ -pregnendion-3,20 has been started a crystalline mixture of two stereoisomeres of the  $\Delta^4$ -pregnenal-20-on-3 is obtained and collected under the same conditions.

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# ALIEN PROPERTY CUSTODIAN

## PLATED ARTICLES AND METHOD OF PRODUCING SAME

Jules Dupuis, Huyssinghen, Belgium; vested in the Alien Property Custodian

No Drawing. Application filed March 13, 1940

The present invention relates to an improved process for the metallization or electroplating of metallic and non-metallic articles, and to the products obtained thereby.

It is the general object of the invention to provide a method for the metallization or electroplating of articles of various kinds whereby uniformly dense and strongly adhering metallic deposits are obtained.

The present invention is applicable to the electroplating of metals, and particularly of magnesium and aluminum and their alloys, including magnesium-aluminum alloys, and likewise to articles made of or coated with non-metallic materials, such as plastic substances, as for example Celluloid, synthetic resins, cellulose acetate plastics and the like, rubber, wood, stone, plaster, and other, preferably hard, normally non-conducting substances.

The process of the present invention makes it possible to provide articles made of the materials above described with a very adherent layer of copper which may itself be subsequently covered with other metallic deposits, such as nickel, bronze, silver, chromium, etc. According to the invention, the surface to be coated is first thoroughly cleaned, and in particular, freed as thoroughly as possible from oils, grease, etc., and if porous, is subjected to a suitable treatment whereby the entrained air or other gases are expelled without at the same time destroying any irregularities on the surface of the article which it is desired to preserve in the finished, electroplated article. The article is then coated uniformly with a lacquer or varnish containing ingredients which promote the chemical precipitation upon the article of a continuous film of a highly conducting metal, such as silver or of silver mixed with other metals.

The lacquer or varnish film has imbedded therein a fine metal powder, preferably copper powder, and preferably also a pigment, which increases the density of the film and aids in promoting the adhesion of the chemically precipitated metallic film to the lacquer or varnish coating. A pigment which has proved to be highly satisfactory is lithopone, but other, preferably light colored pigments can also be employed, either alone or mixed with the lithopone.

The article coated with the film just described is now subjected to the action of chemical solutions which operate to deposit a uniform and continuous film of a metal, such as silver, upon the article. I prefer to deposit this intermediate metallic film in several layers, and to this end

I provide separate tanks, one containing a solution of the metal to be deposited, such as silver nitrate, either alone or mixed with another salt, preferably in ammoniacal solution, and the other containing a precipitating bath, for example, one containing a reduced compound, such as pyrogalllic acid in acid solution, or formaldehyde, or other known precipitating agent for the metal in question. The article is immersed alternately in the two solutions until a number of deposits have been obtained. This metallic layer provides the base upon which the first electrolytic film is deposited. The article is now ready for the electroplating bath.

As already indicated, the first electrolytic deposit may be followed by deposits of other metals, or it may constitute the sole electrolytic deposit. By reason of the intermediate, chemically produced metallic deposit, an extremely firm bond is established between the electrolytic deposit or deposits and the lacquer or varnish film on the surface of the article being treated.

In order that my invention may be more fully understood, I shall describe the same more in detail hereinbelow in connection with certain specific materials and reagents, it being understood, however, that the invention is not restricted thereto.

Where the article to be coated is porous, such as articles of wood, plaster, certain stones, etc., it must first be rendered impermeable and for this purpose may be soaked for several hours in a bath of gum lac or of very light, colorless, cellulose varnish (or lacquer), molten paraffin (where the article is not injured by the elevated temperature) or other similarly inert material, until air bubbles cease to appear. If necessary the surface of the article should then be cleaned to remove any excess of the lacquer or paraffin to restore any surface relief which it may be desired to preserve.

Plastic articles should be rubbed prior to their further treatment; while other hard substances such as glass, porcelain, rubber, etc., should be thoroughly cleaned, and to this end they may be washed with alcohol or other solvent for fats, oils, greases and the like. They may then be placed for a short time in a hot bath of caustic soda composed of 100 grams of caustic soda per 5 liters of water. The articles are then rinsed in fresh water and allowed to dry thoroughly.

The completely dry, oil and grease-free object, for example, an article made of magnesium, aluminum, or their alloys, is now coated with a thin film of a nitrocellulose lacquer or similarly

clear lacquer or varnish containing lithopone and copper powder prepared in the following way: Suspend 75 grams of lithopone in 375 grams of a nitrocellulose or other clear lacquer or varnish of good quality. About 280 grams of thinner are then added, preferably only a part of the thinner being first mixed in so as to facilitate solution. Thereupon 65 grams of red copper powder are slowly added with constant stirring, and finally the rest of the thinner is added and the whole thoroughly mixed. This preparation should be made the day it is to be used as the copper powder causes decomposition on standing. The coating material can be applied with a spray gun, and in order to make certain that the materials have been thoroughly and uniformly mixed, the lacquer or varnish may first be sprayed on a smooth surface to ascertain whether the composition will pass through the gun and whether there are any lumps present, as the latter will be harmful to the metallized finish. If the mixture should be too thick, a small quantity of thinner can be added until all the lumps disappear.

The film is allowed to dry for at least one and preferably several hours; a longer time will be required for certain types of varnishes. To insure that the surface of the coated article is entirely free from oils and grease, whether left by contact with the fingers of the workmen or contained in the varnish or lacquer film, the article is immersed in a hot alkaline solution to effect removal of fatty and greasy material from the surface of the film. The solution may be a soap solution or one of alkali metal hydroxide or carbonate. Immersion for two or three seconds in a hot solution of about 150 grams of potassium carbonate in 5 liters of water has proved to be highly satisfactory. This treatment should of course not be so long or so vigorous as to injure the coating film. In certain cases this treatment aids in so modifying the surface of the film that it is more easily and thoroughly wetted by the solution, to which it is next subjected, although with the particular treatment about to be described, satisfactory wetting is accomplished by the acid solution referred to below. The article is then rinsed with water which, if desired, may be warm.

The articles are now suspended from a non-annealed, red copper wire, crosswise, or in a swinging wire cradle, in order to facilitate their passage through solutions which act to deposit chemically a uniform layer of metal upon the lacquer film. Where the chemically precipitated metal is to be silver, the solutions are prepared as follows:

The first solution comprises a bath containing 90 grams of pyrogalllic acid and 10 grams of acetic acid per liter of water. The second solution is prepared by dissolving 20 grams of silver nitrate in 30 centiliters of commercial ammonia and adding the solution thus obtained to one liter of water. To the mixture there are then added 2 grams of mercuric chloride. The two solutions should be kept in glass receptacles in order to avoid precipitation on the walls.

The articles to be coated, suspended from the copper wires, and, if desired, after immersion in the hot solution of potassium carbonate or equivalent agent, followed by rinsing, are now passed, preferably while still comparatively hot or warm, through the pyrogalllic acid solution. The articles are kept in this first bath just long enough to insure wetting of all of the surfaces of the

articles. The latter are then removed from the bath and the excess pyrogalllic acid solution allowed to drip off. The articles are then immediately immersed in the second bath and swung back and forth in the bath five or six times to insure a uniform deposit of metal upon the articles. The articles are then withdrawn from the second bath and again immersed in the first bath, which should always be stirred for a few seconds. They are thereupon again immersed in the second solution and swung back and forth therein in the manner indicated above. It is important to immerse the articles as deeply as possible in the silver solution as thereby a continuous and uniform metallization is insured. The procedure described is preferably conducted five or six times in the two baths consecutively. Touching of the articles with the fingers should now be avoided, and care should be taken that the suspending copper wires are not too tight to prevent the deposition from being uniformly applied throughout the whole surface of the articles.

The silver-coated articles are now rinsed in fresh water and are then placed directly into an acid-copper electrolytic bath composed of 5% by weight of concentrated sulfuric acid, and 22-25 Bé. copper sulfate, electrolytic red copper anodes being employed. The voltage may vary from  $\frac{1}{2}$  to  $1\frac{1}{2}$  volts, depending upon the installation or the size of the vats. In any case, the voltage should be so regulated as to prevent the articles from burning. The thickness of the metal deposit will, of course, depend upon the length of time that the articles are left in the bath; however, in order to obtain a well polished article, it is necessary to count on two hours of copper plating so as to produce a deposit sufficiently thick to withstand a good polishing.

After the deposit of the copper, the article may be further plated with any desired metal, such as bronze, nickel, chromium, silver, gold, etc.

Where it is desired to exclude the copper deposit from any parts of the articles, such parts should be coated with a non-conducting material of any suitable type. Thus a solution of Jew's pitch (bitumen of Judea), which should not be too thick, can be applied with a brush or spray gun as a coating on the selected parts before the articles are placed in the copper bath. The non-conducting coating should be allowed to dry before the articles are further treated.

My process is of particular advantage in the coating of metal articles which tend to oxidize rapidly in the air, such as aluminum, magnesium, and their alloys. By providing articles of these metals with an oxidation- and rust-resisting metallic surface in accordance with the present invention, they are protected against oxidation, while at the same time the normal advantages such as lightness, cheapness, strength, etc., of these materials are preserved.

The articles coated in the manner above described, whether the base or core is metallic or non-metallic in nature, are characterized by a uniform and dense metallic coating which will not strip off from the base material. Sections cut through articles prepared and electroplated in the manner above described show a metallic coating of uniform thickness imbedded in or fused with the thin lacquer film, the latter acting to anchor the electrolytic deposit or deposits firmly and permanently upon the base material. By the process described hereinabove, electrolytic coatings of permanent character can be pro-

vided upon both metallic and non-metallic articles which ordinarily either will not receive an electrolytic deposit or which permit such a deposit to be readily stripped off. My invention is, of course applicable not only for the coating of an article or surface with a desired electrolytic deposit, but also for protecting other coatings against injury; thus, in accordance with the invention, the silver or reflecting surface of a mirror can be protected against injury in the manner described above.

It will be understood that the plating of the article upon which the layer of chemically precipitated metal, for example silver, has been deposited, can be carried out in the various ways

known in the art. The silver deposit, in conjunction with the lacquer film, provide an excellent conducting surface to which various electrolytic deposited metals will firmly adhere.

It will be obvious that variations from the specific procedures, compositions, and proportions above described may be resorted to within the scope of the appended claims without departing from the spirit of the invention. Thus, instead of swinging the articles in the silver-depositing bath, the articles may be held stationary, especially where they are quite large, and the solution circulated about them by means of a pump or otherwise.

JULES DUPUIS.



# ALIEN PROPERTY CUSTODIAN

## CROSSED STRIP INSULATING COMPLEX FOR CONCENTRIC CABLES

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Alien Property Custodian

Application filed March 16, 1940

Insulation systems for concentric cables nowadays used may be subdivided into two fundamental types, one of which consists of small discs wherethrough the inner conductor passes and which are made of a rigid insulating material, with a relatively great loss angle and, therefore, necessarily removed one apart from the other, whereas the other type consists of a polystyrol with a very small loss angle, made in the form of continuous coils and strips, both wound around the central conductor, like paper strips on the conductors of usual cables with coupled conductors. In the first case the absence of any guide in the intervals between the discs may cause a harmful deformation of the complex of the two conductors; it obliges, moreover to adopt considerable thicknesses for the outer conductor, entailing a loss of flexibility and a high cost of the metallic part. In the second case the nature of the material allows to employ a greater space factor, but here also there is the drawback of an imperfect guide of the conductors.

The object of the present invention is to provide an insulating complex which prevents the above drawbacks and although it allows to limit the space factor to very low figures, it provides an almost continuous support to the outer conductor which can have a most reduced thickness, ensuring in the same time a considerable flexibility, perfect centring and a low cost of the concentric cable.

Said complex consists of at least two strips of low loss insulating material, of known type, each formed by a succession of suitably shaped elements pierced in their centre, having an orientation alternatively variable by  $180^\circ$  and bellows like folded, and interlaced by  $90^\circ$  to each other according to the junction lines of the alternating elements of both strips so as to constitute a substantially helicoidal surface of a sufficient transversal rigidity and easily flexible with respect to its centre line. Said complex of a cellular show affords a great evenness of construction, while the ratio between the volume of air and the volume of solid dielectric keeps at very high values; the inner conductor passes through the aligned holes of the alternating and much approached elements of the two interlaced strips, while the outer conductor supports almost continuously on curves very near to cylindrical coils formed by the suitably shaped sides of the elements of the strips. The assemblage of conductors dielectric is very compact and allows to use a very thin outer conductor, being it possible to reduce the latter, if desired, to a simple binding with a considerable saving of metal and increased flexibility.

All this entails a considerable reduction of the

constructional irregularities of the cable, with a considerable advantage for telephone and television communications, both for long and short distances.

The invention will be better understood with reference to the attached drawing, wherein:

Figs. 1 and 2 represent the development of two different embodiments of the elementary strips of insulating material forming the insulating complex according to the invention.

Fig. 3 is the profile of one of said strips in assembled position.

Fig. 4 is an external view of the insulating complex formed with two interlaced strips, wherein the two conductors are also shown by dash lines.

With reference to the drawing (Fig. 1) each strip consists of a plurality of elements 1, 1', 1'', with their centres 2 aligned, each outlined by a straight line 3, a substantially circular curved line 4, diametrically opposed to the straight line 3, and two lines 5, 5' separating said element from the adjacent elements. Each element is displaced, in the plane of the strip, by  $120^\circ$  with respect to the successive one, so that the curved lines 4, of a diameter corresponding to the inner diameter of the outer conductor, find their place alternatively on the opposite edges of the strip; besides, each element is provided with a central hole 6 of a diameter substantially corresponding to that of the inner conduit. The holes 6 and the curved sides 4 have preferably a hollow shape, so that, for a determinate inclination of the elements of the strip to the centre line 7, they intimately adhere by their perimeter respectively to the inner conductor and outer conductor, thus providing a fastening of the insulating complex on the two conductors. The insulating complex is constituted by two equal strips with their elements alternatively folded, as it will be seen in Fig. 3, along lines 5, 5' the two strips being displaced by  $90^\circ$  to each other with respect to the common centre line 7. The elasticity of the thin insulating material forming the strips allows to vary within a wide range, according to constructional requirements, the axial distance 8 between the corners of the folded strips, at the ends of which small notches 9 are preferably provided to facilitate crossing of the two strips. The arrangement shown by Fig. 2, wherein the elements 1, 1', 1'' are provided with slots 10 whereby the holes 6 are accessible from the straight portions 3 of the strip sides, allows to mount the insulating guide also when the ends of the inner conductor are not accessible.

Of course the number and form of the insulating strips employed may be anyhow varied without exceeding the scope of the invention.

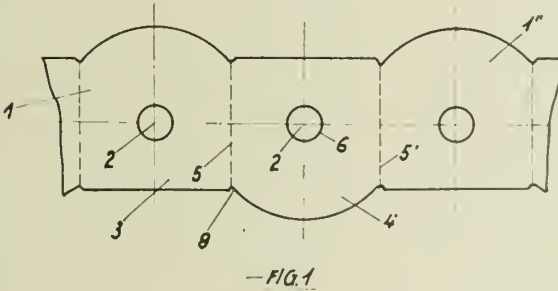
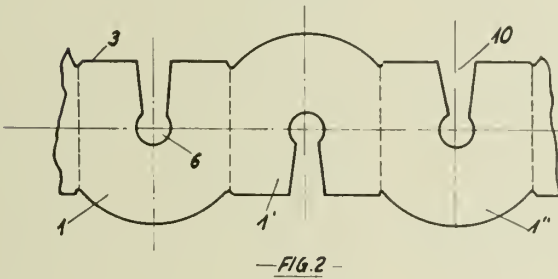
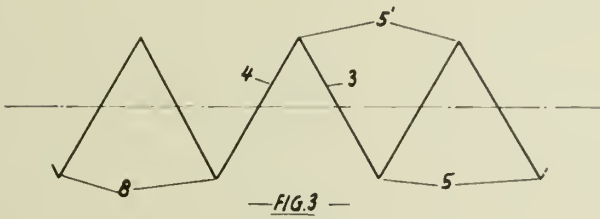
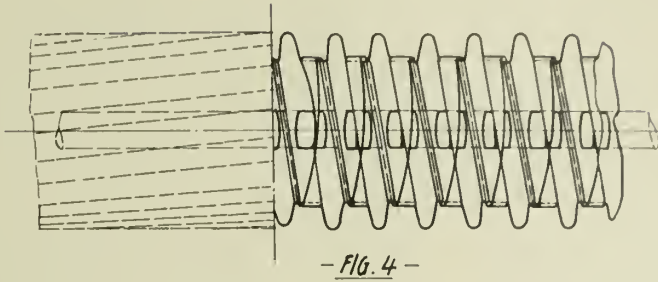
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# ALIEN PROPERTY CUSTODIAN

## ELECTRO-MAGNETIC COILS FOR TELEPHONES AND LOUD-SPEAKERS

Radu Stolojian, Bucarest, Roumania; vested in the Alien Property Custodian

Application filed March 20, 1940

The present invention relates to a low-resistance winding made of a multiple wire for use in loud-speakers and telephone receivers, and the like, and particularly to a multiple wire including a plurality of wires of small section and considerable length.

The main object of my invention is to increase the electro-magnetic field especially in loud-speakers and telephone receivers and consequently to attain better results by changing the windings of existing types of loud-speakers and telephone receivers, so as to afford a satisfactory reception with an ordinary crystal receiver, while using substantially the same amount of material and the same parts as in conventional windings.

The variation of the electro-magnetic field is preferably obtained by increasing the ampere-turns of the winding of the electro-magnet by modifying either the current or the number of turns of wire of the winding.

The greatest insufficiency of the devices under consideration is the resistance of the wire of the winding, which must be of small section and great length in order to allow for a great number of turns of wire and of ampere-turns required for a good sound production.

The present invention removes this difficulty by maintaining the great number of turns of wire while reducing the resistance of the wire, thus effecting an increase of the electro-magnetic field.

This reduction in the resistance is obtained through the use of parallel currents, by employing for this effect a winding in which the conductor consists of several wires of small section and great length wound on the same support, the inlet ends being connected together and the outlet ends similarly connected, and in case there are several such windings they are connected in parallel so that their electro-magnetic fields may add up their effects.

Experiments have determined for each class of apparatus both the number of wires properly composing the multiple wire and the number of turns of wire necessary for attaining the maximum effect, as well as the number of wires with dead ends in the preferred form.

According to the preferred form of the invention, the winding of each coil is composed of several insulated wires, with only some of the same being connected in parallel, by having the ends of the wires at the inlet and at the outlet of each coil connected together so as to obtain a resulting winding of low-resistance, while the remaining wires are connected only at one of their ends.

In the accompanying drawings forming part

hereof, the invention is shown embodied in practical form.

Fig. 1 illustrates a helical winding of wire made according to the present invention.

Fig. 2 shows a plurality of such coils connected together in parallel.

Fig. 3 is a modification of the invention of Fig. 1.

Fig. 4 illustrates a preferred manner of connecting coils of the type shown in Fig. 3 so as to conform to the principles of the invention.

Fig. 6 is another modification based on the form shown in Fig. 3, but with a double winding on the same core, Fig. 5 being a somewhat similar form.

Fig. 7 illustrates a preferred manner of connecting coils of the type shown in Fig. 6 according to the principles of the invention.

In order to make the working principles of the invention clear, I shall first describe the part played by low resistances in a crystal receiver to which a cone loudspeaker is connected.

Contrary to what is commonly believed, some crystal receivers, namely, those using an aerial coupled by induction, are able to detect currents of a few milliamperes within a certain radius of a given broadcasting station.

If the cone-loud-speaker connected to a crystal receiver is equipped with an ordinary winding having 2000 ohms resistance with direct current (impedance about 5000 ohms), the detected current will not pass through in sufficient magnitude because of the high resistance encountered. By replacing the winding of the loud-speaker with another one having 20-50 ohms (impedance 93-120 ohms), the current is increased to a few milliamperes, but the wire being in this case necessarily thicker, the number of turns of the wire will no longer be sufficient to produce an effective magnetic field.

The increase of the current nevertheless has a limit, because the aerial and the crystal receiver itself maintain their resistance unchanged so that beyond a certain limit, no matter how small the resistance of the loud-speaker winding may be, it will no longer influence the total resistance.

It is a well known fact that in wireless telephony the sound is produced by the variations of intensity of the carrier wave, therefore by the variations of intensity of the detected current, which current being stronger in the present case will give rise to greater variations, and consequently louder sounds will be obtained.

My invention, involving the low-resistance winding made of a multiple wire, meets all these

requirements, namely, it has a low resistance obtained by connecting in parallel a number of wires, in addition, a particular sound-increasing effect is obtained through the mutual action of these wires.

In Fig. 1 is shown a winding made up of a multiple wire 1 consisting of several insulated wires 2, e. g. four wires, wound on a support. At the inlet and outlet ends the current carrying wires 2 are soldered together, thus forming the connection ends 3. If there are several coils similarly wound they are to be connected in parallel as outlined in Fig. 2, where two windings A and B appear together.

A loud-speaker with an ordinary winding gives an altogether unexpected performance when equipped with the present winding. While the unmodified loud-speaker connected to a crystal radio receiver remains completely silent, the same loud-speaker equipped with the winding as per the present invention can be heard at a distance of several yards.

For example, we may consider a loud-speaker with an ordinary winding consisting of wire of 3 mils divided in two coils of 4200 turns of wire each (8400 in total) connected in series as usual and having a resistance of 1867 ohms. It has been found by experiment that such a winding consisting of four wires equal to 3 mils and forming 1050 turns of wire in each coil, (therefore  $4 \times 1050 = 4200$  turns in a coil as before, but a reduced resistance of  $1867:64 = 29$  ohms according to Kirchhoff's law of induced currents) gives desirable results, i. e. the electro-magnetic field is noticeably increased because the current detected has to overcome a resistance of only 29 ohms for the same number of 8400 turns of wire, so that the resultant current is stronger and affords at least fair sound production in the loud-speaker and a better hearing in the head-phone of the stations which otherwise were almost inaudible.

The current of 0.530 milliamperes which was the utmost that could be obtained with the unmodified conventional loud-speaker was increased to about 4 milliamperes after the modification of the winding, the aerial employed in both cases being about 55 yards long and 22 yards high for a broadcasting station of 12 kw located at a distance of 30 miles, and to 10 milliamperes for a distance of 6 miles, provided that the characteristics of the low-frequency valve of the radio receiver are modified. With a broadcasting station of 120 kw and an open-air aerial 55 yards long and 12 yards high located at a distance of  $8\frac{1}{2}$  miles from the broadcasting station the current obtained reached 10 milliamperes, while with an aerial in the attic of only 28 yards length the current was 4 milliamperes.

It might appear at first sight that the reduction of the resistance could be obtained equally well by substitution of a wire of greater section for the wire of the winding, but the immediate result is the reduction of the number of turns of wire, because the heavier wire occupies more space than the lighter wire, and consequently the decrease of the field which causes the sound production to become fainter, duller and more indistinct is the final effect.

Fig. 3 shows a preferred form of the invention in which, at one of the ends of the winding part of the component wires are free and the rest of them are soldered together, while at the other end all the wires are connected together. In a

modification of this form these free wires may be distributed among both ends of the winding.

In Fig. 4 is shown the proper manner of connecting two such windings with each other according to the form of Fig. 3, and using the form of winding shown in Figs. 3 and 4 results in a very much greater improvement of the sound production, the sounds becoming clearer and louder. In these last two figures, the multiple wire 1 of the loud-speaker consists of seven (more or less) insulated wires, three of these wires 4 being connected together at one of the ends of the winding, while the other four wires 5 are left free as "dead ends", the number of turns of wire being still 1050 for each coil. The loud-speaker thus wound has afforded sound production comparable to that of a valve-receiver of moderate power.

A similar form to that indicated in Fig. 4 is shown in Fig. 5, which also has a winding consisting of two coils in parallel, the six wires through which the current flows being divided between the two coils, so that on each coil there will be wound a multiple wire consisting of three wires 4 for the current and four dead wires 5, while the coils will be connected in parallel so that their electro-magnetic fields may add their effects.

This form may be used as a loud-speaker winding with a resistance of 2000 ohms in direct current, equipped with two coils in series, which consisted of 3200 turns of wire of 0.07 millimetres wound on each coil, that is a total of 6400 turns of wire on the two coils. The loudest sound was found with three wires equally of 0.07 millimetres and four wires of 0.05 millimetres, and with 610 turns of wire wound, that is  $1/5.25$  of the turns on a coil or  $1/10.5$  of the total number of turns of wire on the two coils prior to the modification. The coils have been connected in parallel in order that their electro-magnetic fields may add their effects, while the resistance of the loud-speaker winding has been reduced accordingly to 33 ohms in direct current. The same good results have been attained also in respect to sound intensity, that is the aerial and the crystal receiver have been able to yield a detected current of 2 milliamperes, although prior to the modification the reception was very weak.

The results obtained with this loud-speaker were as follows: at a distance of 50 km. (31 miles) from a broadcasting station of 12 kilowatts there have been obtained 2 milliamperes with an aerial 20 metres (22 yards) high; at a distance of 10 km. (6 miles) from the same station, 6 milliamperes with an aerial 14 metres (16 yards) high. With a station of 120 kilowatts and a distance of 14 km. (9 miles) there have been obtained 4 milliamperes with an aerial in the attic 25 metres (27 yards) long, and 10 milliamperes with an aerial 10 metres (11 yards) high.

A further and very efficient form of my invention is shown in Fig. 6, illustrating a coil for a loud-speaker which is similarly made by winding a multiple wire consisting of seven insulated wires, all of which are connected to the inlet lead 2, while only three of them are connected to the other lead 3.

Through these three wires the current flows, while in the remaining four wires, which are connected only at one of their ends—no matter which one—with the other wires, no current passes, and these wires are thus the dead wires.

Over this multiple wire a second identical multiple wire is wound (see Fig. 7), which is connected in parallel with the former, so that their electro-magnetic effects are added.

The wires composing the multiple wire are characterized by the fact that for a determined section of the wires through which the current flows and a determined number of wires wound, a maximum electro-magnetic field is obtained, and therefore the loudest sound.

In a loud-speaker which was equipped with a conventional coil having 8243 turns of wire of 0.07 millimetres diameter, with a resistance of 2000 ohms to direct current, the said loud-speaker produced a weak reception with a crystal receiver. By replacing the coil with windings according to Figs. 6 and 7 it was found that the loudest sound was obtained with three wires wound, the diameter of these being 0.08 millimetres, and four dead wires of 0.05 millimetres in diameter (the section of the latter being of no importance), the number of turns of the composite wire being 785, that is  $1/10.5$  of the turns of wire previous to the modification. Over this composite wire a second one is wound identical and connected in parallel with the former.

The resistance of the loud-speaker coil was now only 25 ohms in direct current and if the aerial and the crystal receiver are able to yield a detected current of 2 milliamperes, powerful sounds comparable in quality and volume to those of a valve receiver of moderate power are obtained.

Thus in the case of a head-set equipped with four coils the loudest sound will be obtained by an arrangement similar to that of Fig. 5.

Experience shows that using the "dead ends"

gives by far the most reliable results, especially when employed in loud-speakers, because a dead end added to or removed from the winding has a very pronounced influence upon the tone as well as the volume of the sound and upon the clearness thereof, which would thus better demonstrate the specific value of the winding as of the present invention.

In the winding with "dead ends" these ends are left free, insulated from each other but wound on the reel.

If individual wires are employed the winding may be performed by winding the wires one by one, either side by side or one over another, the ends which remain free being then connected together as already stated.

The foregoing explanations and the examples quoted make obvious the powerful sound-increasing effect obtained by the use of a multiple wire, which effect is mainly due to the dead wires, for a winding in which the dead wires are missing yields a much weaker sound.

A small variation either way of the number of wires composing the multiple wire, both as regards the current carrying wires and the dead wires, does not seriously affect the intensity of the sound, but alters the tone thereof.

In ordinary telephony there have been obtained sounds in the loud-speaker as far as 14 kilometres (9 miles) on an open air line passing through three exchanges.

In valve radio receivers nevertheless, the low resistance is of no avail, as the current is produced by the electronic flux of the valves, consequently, it is evident that the improved results are due to the multiple wire alone.

RADU STOLOJIAN.



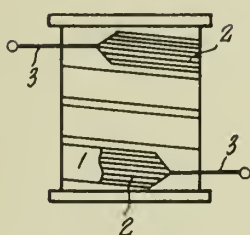
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BY A. P. C.

R. STOLOJIAN  
ELECTRO-MAGNETIC COILS FOR TELEPHONES  
AND LOUD-SPEAKERS  
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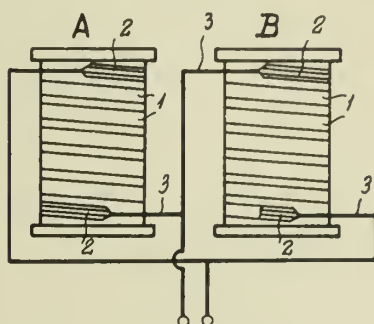
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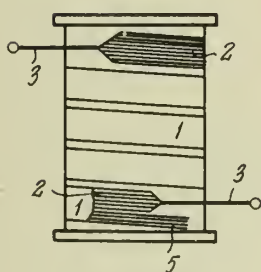
*Fig. 1*



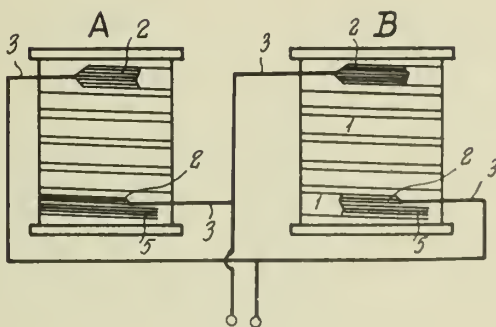
*Fig. 2*



*Fig. 3*



*Fig. 4*



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PUBLISHED

MAY 18, 1943.

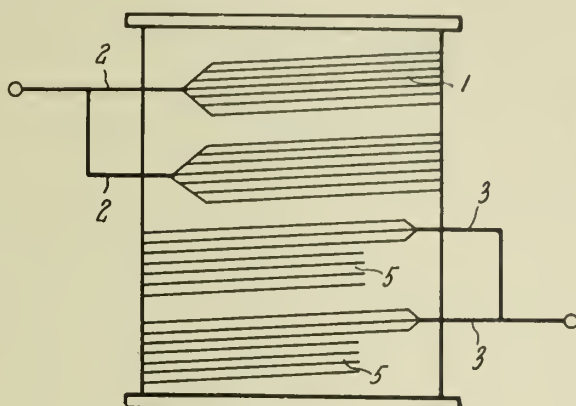
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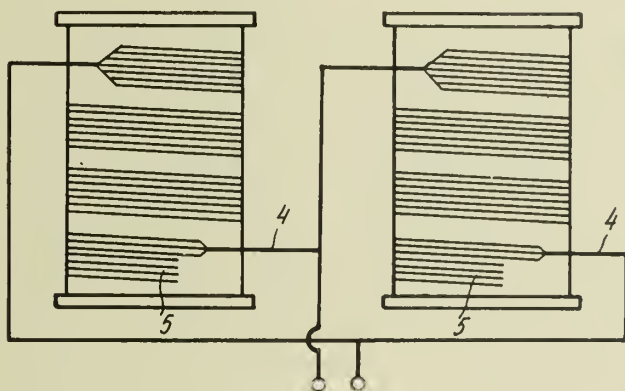
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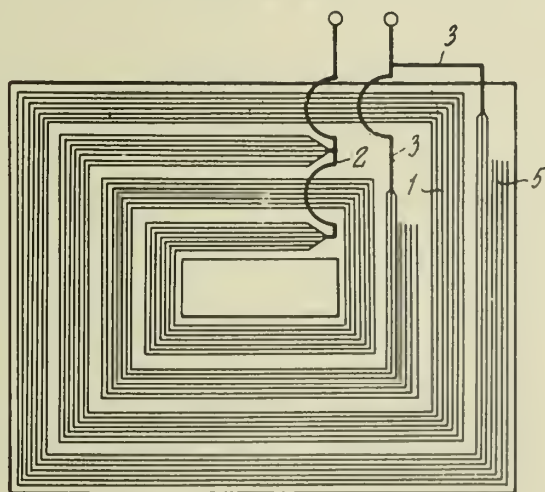
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*Fig. 6*



*Fig. 5*



*Fig. 7*

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# ALIEN PROPERTY CUSTODIAN

## PROCESSES FOR THE PROTECTION OF METALS AND ALLOYS

Jean Frasch, Clichy, France; vested in the Alien Property Custodian

No Drawing. Application filed March 28, 1940

It is known that metal surfaces can be treated so as effectively to preserve them from corrosion (as for example anodised aluminium or phosphatised iron). Such treatments are usually carried out in solutions of inorganic or organic compounds, and among these may be cited fatty substances and hydrocarbons such as paraffin. Paraffin, which melts as low as 50°, closes the pores of the protective coating and forms a further protective covering to the surface of the metal. But although this film of paraffin has the appearance of being adherent, in reality it is not so; it detaches itself if the metal is repeatedly immersed in and withdrawn from a solution, and often merely under the action of rain. This is because the paraffin is not chemically but only mechanically attached; it therefore detaches itself easily under mechanical stress, and the metal remains subject to attack by corrosion.

The inventor has already described in Patent U. S. A. 314,349 lodged on 17th January 1940, under the title of "Process for the protection of metallic objects by galvanic treatment" a finishing operation to be applied to a specific protective coating composed principally of manganese oxide, obtained by the galvanic treatment described in the above mentioned patent. This finishing operation consisted in the immersion of the metal object in a bath of paraffin or analogous hydrocarbon at temperatures comprised between 150 and 200° C.

Further researches have permitted the inventor to precise and fix the conditions under which the above treatment must be carried out and also to establish the fact that if the treatment is carried out under the conditions in question, it permits of notably improving the resistance to corrosion of all films having as their basis salts or oxides, even if these are painted. Moreover such a treatment affords a relative protection even on unprotected metal surfaces.

In putting this new invention into practice, the metal covered by a protective film produced by any desired process (galvanic or chemical treatment, anodic oxidation, etc.), is immersed in paraffin or an analogous hydrocarbon at a temperature above 170° and preferably above 180° C. An evolution of gas results and the treatment must not be stopped before ceases. It is however a wise precaution to continue the treatment three or four minutes longer.

At the temperatures indicated above, the immersion does not give rise to a simple layer of paraffin by mechanical impregnation but causes a veritable dehydration and deoxidation which

profoundly modifies the nature of the original protective film. Oxides and salts are dehydrated, and the oxides themselves transformed into lower oxides. Thus for instance  $\text{Fe}_2\text{O}_3$  is reduced to  $\text{Fe}_3\text{O}_4$ , and  $\text{CrO}_3$  to  $\text{CrO}_2$ .

The inventor has further found that the layer of paraffin resulting from the above described treatment is much more adherent than that which can be formed in any other way, and that it cannot be detached from the subjacent metal even by mechanical deformation.

The following is one preferred means of putting this new invention into effect, but it is given by way of example only and must not be construed in any limitative spirit. A sample of magnesium is coated with a film of  $\text{Mn}_2\text{O}_3$  by galvanic treatment in a bath of  $\text{MnCr}_2\text{O}_7$ . After drying in air, the sample is immersed for 5 minutes in hot paraffin at 195° C. During the immersion water vapour and  $\text{CO}_2$  are evolved. After removal, it is found that the brown film of  $\text{Mn}_2\text{O}_3 \cdot x\text{H}_2\text{O}$  has been transformed into anhydrous black  $\text{Mn}_3\text{O}_4$ , which is much more resistant to corrosion than the former.

The inventor has moreover found the surprising result that this treatment in hot paraffin or analogous hydrocarbon tends to make the original protective film more plastic, and has a most markedly beneficial effect even on very dry paints which show only poor adherence and pliability. The following example, which again is no way limitative, may be cited. A sample of oxidised aluminium was painted and then submitted for one month to a corrosion test in salt spray. At the end of this time, the protective coating, although it had not flaked off, had become stiff and brittle, with the result that it broke off on bending. An identical sample covered with same painted protective coating was first dipped for 5 minutes into hot paraffin at 190° C., and then submitted to an identical corrosion test. In this instance the coating remained perfectly pliable and the paint showed no tendency to break off on bending.

The inventor has found that good results can also be obtained if the present invention is applied to untreated metallic surfaces, for one can even in such instances obtain a firmly adherent coating. This phenomenon is probably due to the deoxidation of the thin film of oxide which adheres to the metal, and which, as for instance in the case of iron, catalytically produces auto-oxidation.

JEAN FRASCH.



# ALIEN PROPERTY CUSTODIAN

## PROCESS FOR THE TREATMENT OF METALS BY MEANS OF GALVANIC CURRENT IN WHICH THE METAL TO BE PROTECTED SERVES AS CATHODE

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Property Custodian

No Drawing. Application filed March 28, 1940

Three methods have hitherto been employed for the protection of metals against corrosion:

(1) *Electrolytic treatment, that is to say the application of an external source of electric current.*—By this means one can either obtain an electrodeposited layer of another metal (as for instance in nickel and chromium plating); a deposit of an oxide or a salt of the metal to be protected (as for instance in the case of the anodic treatment of aluminium or the silicate treatment of magnesium); or the electrodeposition of the oxide of another metal, always more or less mixed with the oxide of the metal to be protected (as for instance in the case of the treatment of magnesium with alternating current in a solution containing chromic ions).

(2) *Chemical treatment.*—By this means one obtains on the surface of the metal to be protected, as the result of the chemical action of the medium in which it is immersed, a layer of one of its oxides or salts (as for instance in the phosphatisation of iron or in one of the chemical processes for the protection of aluminium by oxidation); the deposition of a layer of metal by ionic displacement (as for example in the deposition of copper on zinc immersed in a solution of a copper salt); or of a layer of oxides of another metal, always more or less mixed with the oxide of the metal to be protected (as for example in the deposition of oxides or molybdenum upon zinc immersed in solution containing molybdenum).

(3) *Treatment by chemical contact.*—This procedure differentiates itself from the preceding treatment by the fact that in this case the metal to be protected must be in mechanical contact with a third metal which begins to effectuate the deposit and may be considered to initiate the reaction. An example of such a process is to be found in the protection of iron by aluminium, where it is necessary to surround the iron by a thin band of zinc. The aluminium first commences to deposit on the zinc, and the iron is then coated in its turn by the aluminium; whereas there is no deposit of aluminium on the iron in the absence of zinc.

The present invention has for its object an entirely new process for the protection of metals, which has given surprisingly good results. Its basis consists in utilising an electric current produced galvanically, by which means a deposit is obtained on the metal object it is desired to protect; that is to say one operates without employing any external source of electric current, and the electric current which serves to deposit the

protective coating is obtained by joining two different immersed metals, one of which functions as cathode and the other as anode, by means of an external conducting circuit.

The inventor has already described in his previous Patent No. 314,349, January 17th, 1940, lodged under the title "Improvements in protection of metallic objects by galvanic action," a process by means of which one can obtain a layer of an oxide of manganese upon metals which are immersed in solutions in which are dissolved compounds giving ions containing the element manganese. In the process set forth in the above patent the metal to be protected functions as anode, and is joined by means of an external electric circuit to a cathode, preferably composed of carbon.

Further experiments by the said inventor have enabled him to make the surprising discovery that if a galvanic treatment is employed in which the metal to be protected functions not as anode but as cathode, such a process may serve as a general means by which all metals may be protected, and that in particular such a process affords an exceedingly effective treatment against corrosion for such metals as aluminium, iron, copper, lead and their alloys.

An altogether remarkable advantage of the treatment set forth and described in the present invention is that the protective layer deposited on the metal is of uniform thickness irrespective of the form of the metal object on which it is deposited. This is so even in the event of the said metal object presenting hollows or recesses; whereas if electrolytic processes of protection are employed, the protection afforded to such hollows or recesses is always deficient.

The present invention permits moreover of depositing a film of oxides other than those of the metal to be protected, which fact is of particular importance in the case of iron whose oxides act as catalytic promoters of deep seated corrosion.

The bath may consist of any solution which permits of obtaining a galvanic current with the electrodes chosen. The inventor has found that particularly efficacious results are obtained when employing solutions containing salts, oxides, acids or bases in which figure a metal capable of two or more degrees of oxidation, whose lower valency compounds are insoluble in water, such for example as manganese, chromium, titanium, vanadium or molybdenum. As a result of the galvanic current, the solution is reduced in the neighborhood of the cathode with result that a layer of insoluble oxide is deposited and fixes itself firmly

to the cathode. As an example may be cited the reduction of  $\text{KMnO}_4$  to  $\text{Mn}_2\text{O}_3$  or  $\text{Mn}_3\text{O}_4$ .

In contradistinction to the lines of electric force produced by an electrolytic current due to an external source, the lines of electric force produced by a galvanic current, in as much as they have their origin in the metal itself, are uniform and regular, and penetrate into the most pronounced hollows and recesses.

As has previously been explained, all metals are capable of acting as cathodes when treated according to the present invention, providing always a more electropositive metal functions as anode. Thus, for instance, in highly oxidising solutions, such for instance as  $\text{KMnO}_4$ , the cathode may be constituted by an object in iron or aluminium which it is desired to protect, while the anode consists of magnesium or zinc. In this case, both metals become coated with adherent deposits having for basis an oxide of manganese highly resistant to corrosion.

It is in general preferable that there should be a difference in potential of at least 1 volt between the cathode and anode; but in many instances a smaller difference of potential is sufficient to ensure the deposition of an adequate protective coating.

The following is a description of the exact manner in which the present invention may be put into effect; it is however given merely by way of example, and must not be construed in any limitative spirit.

The solution consists of  $\text{KMnO}_4$  and chromic acid, the anodes are composed of magnesium and the cathodes of objects in iron or aluminium which it is desired to protect. The potential difference is about 1.9 volts. The iron or aluminium becomes coated with a uniform film of  $\text{Mn}_2\text{O}_3$  free from  $\text{Al}_2\text{O}_3$  or  $\text{Fe}_2\text{O}_3$ . An identical film is deposited at the same time on the magnesium anodes.

In general, 15 minutes suffice to produce a coating which serves as an excellent basis for painting. If the objects are not subsequently to be painted, they should be left for about half an hour and then preferably dipped in hot paraffin after previous drying.

The present invention also covers the same treatment when applied to the degreasing of

metals. It is general knowledge that nascent hydrogen serves as an excellent means of thoroughly degreasing metals. The manner in which the present invention of degreasing metals is put into effect is to immerse the metal in an appropriate solution and connect it by means of an external electric circuit to another more electropositive metal also immersed in the same solution, which more electropositive metal then functions as anode. For instance if an object in iron is thus connected to an object in aluminium, a galvanic electric current traverses the solution, and hydrogen is evolved on the iron which functions as cathode.

The inventor has moreover made the surprising discovery that this action of degreasing can be still further increased and ameliorated if the potential difference between the anode and cathode is increased by hanging upon the same metallic support to which the object to be degreased is attached, objects in another substance which have the power either of increasing the said potential difference, or even of lowering it to such an extent that the sign of the voltage becomes reversed, thus causing the previous anode to become the cathode and vice versa. As an example, one may again cite the case of aluminium and iron referred to above. Thus for instance if objects in carbon are attached to the same bar which serves to support the aluminium objects, the aluminium becomes less electropositive than the iron and now forms the cathode instead of the anode, with the result that hydrogen is evolved no longer on the iron, but on the aluminium which it degreases. On the other hand, if the objects in carbon are hung on the same bar as the iron objects, the original difference of potential is increased, and the degreasing action on the iron is more rapid and effective.

The present invention also covers by way of new industrial products, all metallic objects on which a protective coating has been deposited while they served as cathodes in a bath transporting a galvanic current and all metallic objects which have been degreased by similar means.

JEAN FRASCH.

# ALIEN PROPERTY CUSTODIAN

## TELEVISION RECEIVERS

Peter Deserno, Berlin, Germany; vested in the  
Alien Property Custodian

Application filed March 29, 1940

In television receivers the automatic amplitude regulation meets with difficulties. The simple expedient of forming a mean value of the high frequency energy in order to produce the regulating voltage is not possible because the mean value changes in accordance with the luminosity values of the picture. In the case of bright pictures the mean value would be greater than with dark ones.

Transmitting arrangements are known which are based on the so-called gap synchronization, that is, a synchronizing method in which the picture signals increase toward positive values from an amplitude that corresponds to the black value of the incoming signal voltage, while the synchronizing signals are extended from the black value in the reverse direction toward the zero value. With these transmitting arrangements a regulating voltage may be obtained by taking from the frequency mixture the amplitude which is equivalent to the black value. This amplitude merely depends upon the magnitude of the received high frequency energy, being independent of the luminosity values of the picture.

According to the invention, in order to produce the regulating voltage equipment to the black value the synchronizing signals are filtered out from the rectified frequency mixture, which contains the picture and synchronizing signals, by means of a choker device while the remainder of this mixture is conveyed to a condenser in such manner that its potential shall rise to become equal to the black value. To such end the voltage supplied to the condenser passes through a rectifier which prevents back discharge of the condenser over the feeding source, such as a coupling resistance. The condenser is thus always charged to the maximum value of the feeding voltage. The voltage supplied to the condenser is applied to it with such a polarity that its potential increases whenever the arriving voltage varies toward the black value.

The choker device by which the synchronizing signals are filtered out from the rectified frequency mixture is dimensioned to cut off all such frequencies as are above line frequency. The voltage at the condenser will hence not be able to increase beyond the black value, the synchronizing impulses having been segregated.

In order to enable the potential at the condenser to decrease in accordance with the black value whenever the receiving amplitude increases, a resistance is connected in parallel with this condenser. Such resistance and condenser are calculated to afford a time constant that accords with the duration of the several picture periods, such as a second.

In the accompanying drawing, Fig. 1 is a circuit diagram showing one embodiment of the invention, while Figs. 2 and 3 illustrate curves referred to in explaining the function of this embodiment.

An electron tube H, Fig. 1, is the last stage of the intermediate frequency amplifier of a television receiver. To this tube a final tube  $G_1$  is connected through a transformer T. Tube  $G_1$  is arranged to act as a rectifier in known manner. The potential arising at a resistance W and a condenser K acts to control the anode current of tube  $G_1$  by means of a control grid thereof, as will be seen in Fig. 1. In the cathode lead of the tube  $G_1$  a coupling resistance A is included which is grounded in unipolar fashion. At resistance A a voltage arises that corresponds to the rectified frequency mixture containing picture and synchronizing signals. The curve  $U_A$  of this voltage is illustrated in Fig. 2.

A choke coil D acts to cut off all those frequencies which are above line frequency. At points P, Q a voltage UPQ, Fig. 3, is effective which has the synchronizing impulses segregated. The maximum value of this voltage hence equals the black value of the incoming voltage, as will be understood from Fig. 3. Condenser C thus charges to acquire a potential  $U_c$  that corresponds to the black value.

Rectifier  $G_2$  prevents the condenser from discharging through resistance A. Condenser C discharges over resistance R whenever the dark value changes. The dimensions are such that condenser and resistance shall afford a time constant of about a second.

The regulating voltage is derived from condenser C, as indicated by the arrowed line QC, in order to be conveyed to a control tube or several such tubes.

PETER DESERNO.



PUBLISHED  
MAY 18, 1943.  
BY A. P. C.

P. DESERNO  
TELEVISION RECEIVERS  
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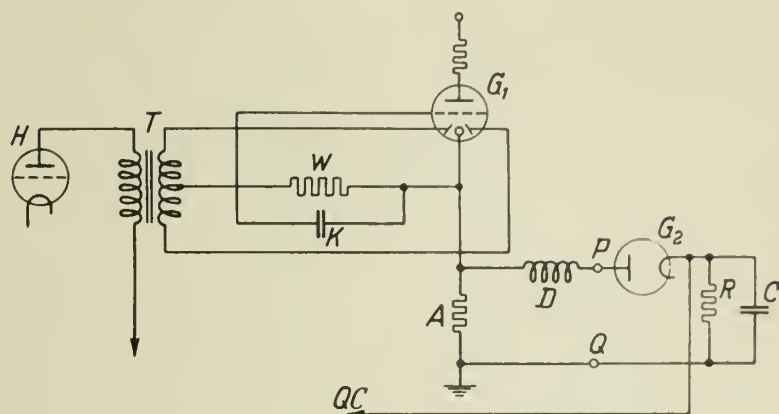


Fig. 1

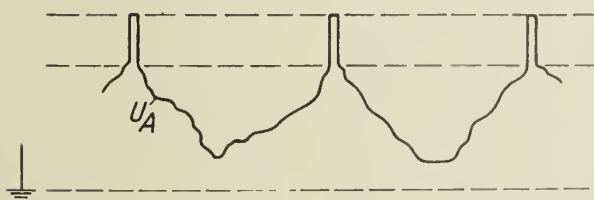


Fig. 2

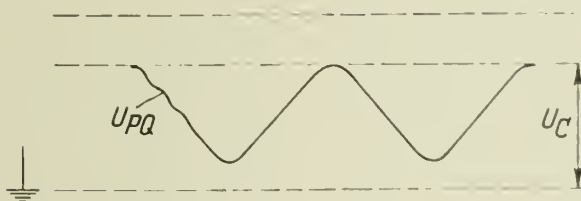


Fig. 3

Inventor:  
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Att'y



# ALIEN PROPERTY CUSTODIAN

## AMPLITUDE LIMITING CIRCUITS

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in the Alien Property Custodian

Application filed March 29, 1940

There are many known circuits for limiting the amplitude of an alternating current to a certain limiting value for the purpose of excluding interference peaks, for instance in radio reception. For this limiting action electron tubes having a grid have been proposed. These tubes have the drawback that even for signal amplitudes suited for transmission without exceeding the range of control of the tubes the curvature of the bend of the tube characteristic seriously unpairs the sharpness of the cut off, so that the harmful interference peaks are also transmitted, at least to a certain extent. It is also impossible to obtain a sharp limitation by means of those known methods in which a diode bridged across an impedance, for instance an electron tube, short-circuits said impedance on the occurrence of an interference. As the resistance of a diode is of the order of magnitude of 1000 Ohms the short circuit will not be complete. Further the sudden change of impedance may cause serious trouble. For the purpose of eliminating interference it is also known to employ a diode which is supplied with current from a rectifier and prevents transmission of the greatest signal amplitudes, for instance those exceeding 100% modulation. With circuits of this kind it is merely possible to obtain a slight reduction of interference and the distortion is usually great.

Further it has been proposed to employ amplitude limiting circuits in which the alternating current to be limited is passed through two electron tubes which are provided with control grids and are connected in tandem from an a. c. point of view. The tubes are connected in such a manner that as soon as the input voltage reaches a predetermined limiting value grid current is produced preventing the anode current from further increasing. One of the tandem connected tubes is for limiting one half wave of the alternating current and the other is for limiting the other half wave. The drawback of this circuit is that the operation is not reliable and that the limiting operation is attended by distortion.

The invention also relates to an amplitude limiting circuit of the kind in which the alternating current or voltage to be limited is passed through two tubes connected in tandem from an a. c. point of view. The invention is characterized in that the tubes referred to are diodes the d. c. and a. c. circuits of which are controlled independently, further in that the first diode is so connected to the second diode that the alternating voltage to be limited is supplied to the two diodes in opposite directions, and in that the

diodes are supplied with a bias voltage (preferably proportional to the amplitude of the voltage to be limited) of such magnitude that, whereas the alternating voltage to be limited will just be passed by the diodes without rectification, the first diode will cut off the amplitude peaks exceeding the limiting value and being superimposed on one of the half waves of the voltage to be limited, and the second diode will cut off the amplitude peaks exceeding the limiting value and being superimposed on the other half wave of the voltage to be limited.

The invention enables a reliable, sharp and distortionless amplitude limitation to be obtained and, compared with other diode limiting systems, guarantees a reduction of interference of higher degree. Further the circuit is very simple.

In a preferred embodiment of the invention the diodes are so connected in tandem that either their cathodes or their anodes are interconnected by a condenser. In another favourable embodiment of the invention the diodes are connected in tandem by means of an intermediate amplifier in such a manner that the first diode is connected to the input and the second diode to the output of the amplifier. Further the diodes may be connected in tandem by means of a transformer.

The invention will be explained with reference to the drawing.

Fig. 1 shows a fundamental circuit embodying the invention.

Fig. 2 is for the purpose of explaining the operation of the circuit.

Fig. 3 shows a preferred embodiment of the invention.

Figs. 4 and 5 show modifications of this embodiment.

Fig. 6 shows another embodiment of the invention.

In all figures corresponding elements are provided with like reference characters.

Fig. 1 shows input terminals 1 and 2 connected to the first diode 5 by a condenser 3 and a resistance 4. The diode 5 is provided with an output resistance 6. The resistances 4 and 6 are interconnected by a condenser 7. The second diode 10 is connected in tandem with the diode 5 by means of a condenser 8, the arrangement being such that either the anodes or the cathodes of the two diodes are interconnected by the condenser 8. This means that the two diodes are connected in opposite directions. The second diode 10 is provided with an input resistance 9 and an output resistance 12 which are interconnected by a condenser 11. In parallel to the resistance 11 are

connected the condenser 13 and the resistance 14. The output terminals 15 and 16 are connected to this resistance. The diode 5 is supplied with a bias voltage from the terminals  $-B_1$  and  $+B$  of a direct current source, and the diode 10 is supplied with a bias voltage from the terminals  $-B_2$  and  $+B$  of the same source. The voltage between  $-B_1$  and  $+B$  is higher than that between  $-B_2$  and  $+B$ .

The operation of the circuit may be explained with reference to Fig. 2. Diagram *a* shows a complete oscillation  $f_1$  of the voltage to be limited. This voltage is supplied to the terminals 1 and 2 and may have interference peaks  $Z_1$  superimposed on the positive half wave and interference peaks  $Z_2$  superimposed on the negative half wave. Diagram *b* shows the current-voltage characteristic of the diode 5 ( $i_a$  in terms of  $E_d$ ). Diagram *c* shows the corresponding characteristic of the diode 10. As shown in diagram *b* the diode 5 is supplied with a bias voltage  $e_5$  of such magnitude that both halves of the alternating voltage  $f_1$  occurring across the resistance 4 are passed by this diode without rectification. The interference peak  $Z_1$ , however, which is superimposed on the positive half wave is cut off. Consequently there will be transferred from the resistance 6 through the condenser 8 to the resistance 9 an oscillation one of the half waves of which is limited. As the diode 10 is connected to the resistance 9 in a sense opposite to the connection of the diode 5 to the resistance 4 the oscillation just mentioned will be reversed with respect to the diode 10, as shown by  $f_2$  in diagram. The diode 10 is supplied with a bias voltage  $e_{10}$  of such magnitude that the oscillation  $f_2$  is passed by this diode without rectification but that the interference peak  $Z_2$  superimposed on the other negative half wave is cut off. Consequently both half waves of the oscillation leaving the diode 10 are limited. From the output terminals 15 and 16 the limited oscillation, which is represented by  $f_{15}$  in diagram *d*, is passed to the following stages of the circuit.

As indicated above the first diode 5 in the circuit of Fig. 1 is supplied with a higher bias voltage than the second diode 10. The reason is that from an a. c. point of view the resistance 6 of the diode 5 is loaded by the circuits of the diode 10. In case of the diode 10, however, the high impedances 13 and 14 connected in parallel to the resistance 12 of the diode 10 merely constitute a relatively low load for this diode. Consequently the alternating voltage supplied by the diode 5 will not appear in its full value across the resistance 9. Thus, the load on the diode 5 being higher than that on the diode 10, the diode 5 is to be supplied with a higher bias than the diode 10.

The bias voltage of the diodes may be supplied by any direct current source. It is recommendable to provide a source of current comprising a rectifier operated by the voltage to be limited. In that case the bias will be proportional to the amplitude of said voltage. Circuits embodying this feature are shown in Figures 3, 4 and 5. The limiting circuit employed in these figures is substantially the same as that in Fig. 1.

In the circuit of Fig. 3 the low frequency voltage to be limited is supplied from the input terminals 1 and 2 to the amplifier tube 20. This tube is preferably one having a wide range of control. The alternating voltage produced in the load resistance 21 of the tube 20 is supplied to

the limiting circuit already described by way of the tap 22 and the condenser 3.

A double diode 25 is provided for producing the bias voltages for the diodes 5 and 10. The right hand section of the double diode 25 is connected to the point 23 of the resistance 21, and the left hand section of the double diode 25 is connected to the point 24 of the resistance 21, the point 24 having a lower potential than the point 23. The two connections just described comprise condensers 26 and 27. The rectified voltage produced in the right hand section of the diode 25 is taken from the load resistance 28 through a filter circuit comprising the resistance 29 and the condenser 30, and through a resistance 4 to the anode of the limiting diode 5. The rectified voltage produced in the left hand section of the diode 25 is taken from the load resistance 31 through a filter circuit comprising the resistance 32 and the condenser 33, and through a resistance 12 to the anode of the limiting diode 10. The circuit arrangement is such that the anodes of both limiting diodes 5 and 10 will receive a positive voltage with respect to their cathodes so that the diodes will be conductive. As the point 23 of the resistance 21 is of higher voltage than the point 24 of the same resistance the diode 5 will be supplied with a higher bias voltage than the diode 10.

If the input terminals 1 and 2 do not receive any low frequency voltage, that is if there is no signal voltage, the double diode 25 will not supply the diodes 5 and 10 with bias voltages, so that there will be no current flowing in these tubes. If, however, the terminals 1 and 2 are supplied with signal voltage the limiting diodes 5 and 10 will receive a bias voltage and a signal voltage of corresponding value will be passed by these diodes in the manner described in connection with Fig. 2. The steady current of the limiting diodes, that is the diode current occurring even when there is no potential difference between the terminals 1 and 2, may be compensated for by supplying a compensating bias voltage to the diodes from a suitable point of any amplifier tube, for instance from the point 35 of the cathode resistance of the tube 20. In case the steady current may be neglected the rectifier sections in the tube 20 may be combined. In that case the lower ends of the resistances 4 and 12 are earthed and the cathodes of the limiting diodes 5 and 10 are supplied with a smoothed negative bias voltage.

The bias voltage of the limiting diodes may also be supplied by a rectifier operated by the limited signal voltage. In that case the regulation is carried out backwards. If a fine regulation is not necessary the bias voltage for the limiting diodes may be derived from a constant voltage derived from the mains. In that case a variable resistance controlling the bias voltage may be adjusted together with the member controlling the signal strength. The circuit elements supplying the bias voltage may also be made independent of the receiving channel by providing an amplifier stage in parallel to the receiving channel and by rectifying the alternating voltage delivered by this amplifier.

Figures 4 and 5 show modifications of the circuit of Fig. 3.

The circuit of Fig. 4 is different from that of Fig. 3 in that the load resistance in the anode circuit of the tube 20 is replaced by a choke coil 40 across which the resistances 41, 42, 43 and 44 are connected through a condenser 41. The re-

quired alternating voltages are taken from the points 22, 23 and 24. These points correspond to those bearing the same reference numbers in Fig. 3. It is an advantage of the circuit of Fig. 4 that there is no d. c. load in the anode circuit of the tube 20, so that the useful output voltage is not reduced.

The circuit of Fig. 5 is distinguished from that of Fig. 3 and 4 in that the anode circuit of the tube 20 is provided with a transformer having a primary winding 50 and a secondary winding 51. The voltages to be passed to the double diode 25 producing the bias voltages for the diodes 5 and 10 are taken from the points 52 and 53 of the secondary transformer winding, and the alternating voltage directly supplied to the first diode 5 is taken from the point 54. The advantage of this circuit is that the transformer 50, 51 causes the anode alternating voltage of the tube 20 to be stepped up so that higher bias voltages may be obtained.

It is observed that Figures 4 and 5 have the double diode 25 reversed with respect to its position in Fig. 3, so that the left hand section of the double diode produces the bias voltage for the diode 5 and the right hand section for the diode 10.

In connection with Fig. 1 it has been stated that in view of the different alternating current loads of the two limiting diodes the first diode 5 is to be supplied with a higher bias voltage than the second diode 10. These different loads may be prevented by providing an amplifier tube between the two diodes. The diodes will then be independent from each other so that the circuits of the second diode will not constitute an alternating current load for the first diode. The intermediate amplifier tube should preferably have a wide range of control so that even for great signal amplitudes there will be no distortion. Preferably the amplification of the intermediate tube is made substantially equal to the attenuation produced by the first diode so that this attenuation is compensated for. In that case both diodes may be supplied with the same bias voltage.

Fig. 6 shows an embodiment of a circuit having an intermediate tube. An amplifier tube 60 is arranged between the diodes 5 and 10. The input circuit of the amplifier comprises a coupling condenser 61 and a resistance 62, and the output

circuit comprises a load resistance 63 and a condenser 64. In Figure 6 the sense of connection of the diodes 5 and 10 is the same in view of the fact that the signal voltage is reversed in the tube 60 so that the voltage across the resistance 9 is opposite to that across the resistance 4, which is necessary for a satisfactory operation of the limiting circuit (see Fig. 2).

Connected to the limiting diode 10 is an amplifier tube 65 for amplifying the limited alternating voltage. The tube 65 is provided with a cathode resistance 66, and the anode circuit of the tube comprises the primary winding 67 of a coupling transformer. For the alternating current the winding 67 is bridged by a condenser 68 and a potentiometer 69. The tap on the potentiometer 69 is connected through a condenser 70 to a rectifier 72 producing the bias voltage and having a load resistance 71. The voltage across this resistance is smoothed by a resistance 73 and a condenser 74 and it is supplied through the resistances 4 and 9 to the cathodes of the limiting diodes. The bias voltage is thus supplied by a rectifier operated by the limited voltage, both limiting diodes receiving the same bias voltage.

In case of a limiting action depending on the degree of modulation it may be useful to have the bias voltage for the limiting diodes supplied by a rectifier connected to the anode circuit of a special amplifier tube controlled by the alternating voltage to be limited. In that case if there is no modulation the receiving channel remains completely closed, so that distortion will be prevented that might otherwise occur due to transients at the beginning of the modulation when using a bias voltage supplied backwards. In case of a limiting action depending on the degree of modulation it may also be useful to cut off the higher interference peaks, for instance those exceeding 100% modulation, in any known manner in a stage preceding the limiting diodes.

The limiting circuit according to the invention may be employed in any receiver and in any stage of a receiver. Likewise it may be employed for limiting high frequency and video frequency currents. Instead of the two electrode diode tubes shown in the figures dry rectifiers or tubes having a grid but connected as diodes may be employed.

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PUBLISHED  
MAY 18, 1943.  
BY A. P. C.

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AMPLITUDE LIMITING CIRCUITS  
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Serial No.  
326,567  
5 Sheets-Sheet 1

FIG. 1

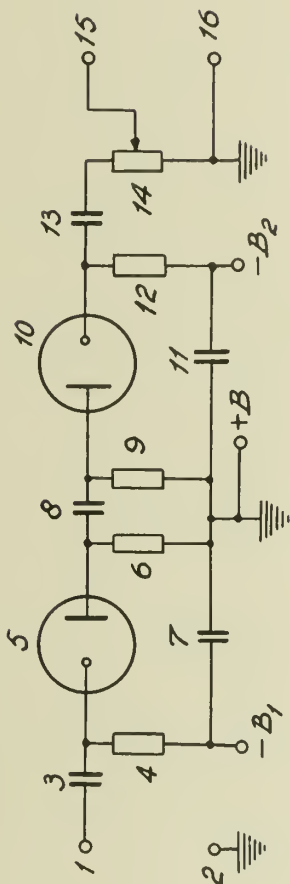
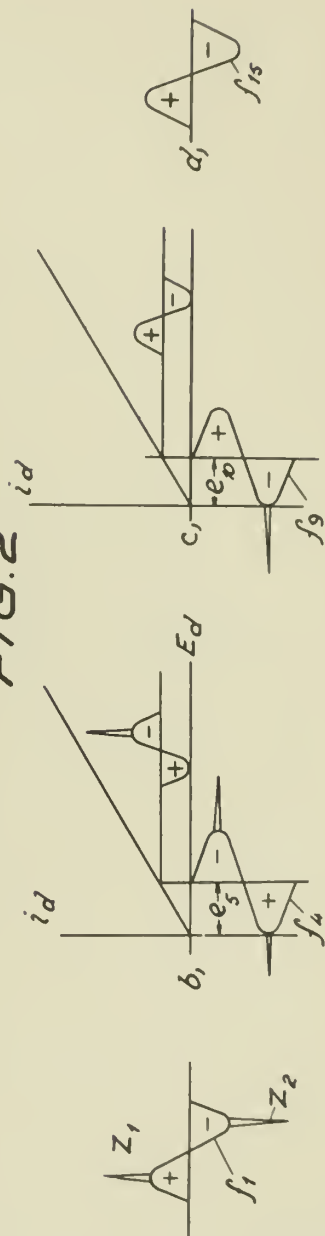


FIG. 2



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PUBLISHED

MAY 18, 1943.

BY A. P. C.

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AMPLITUDE LIMITING CIRCUITS

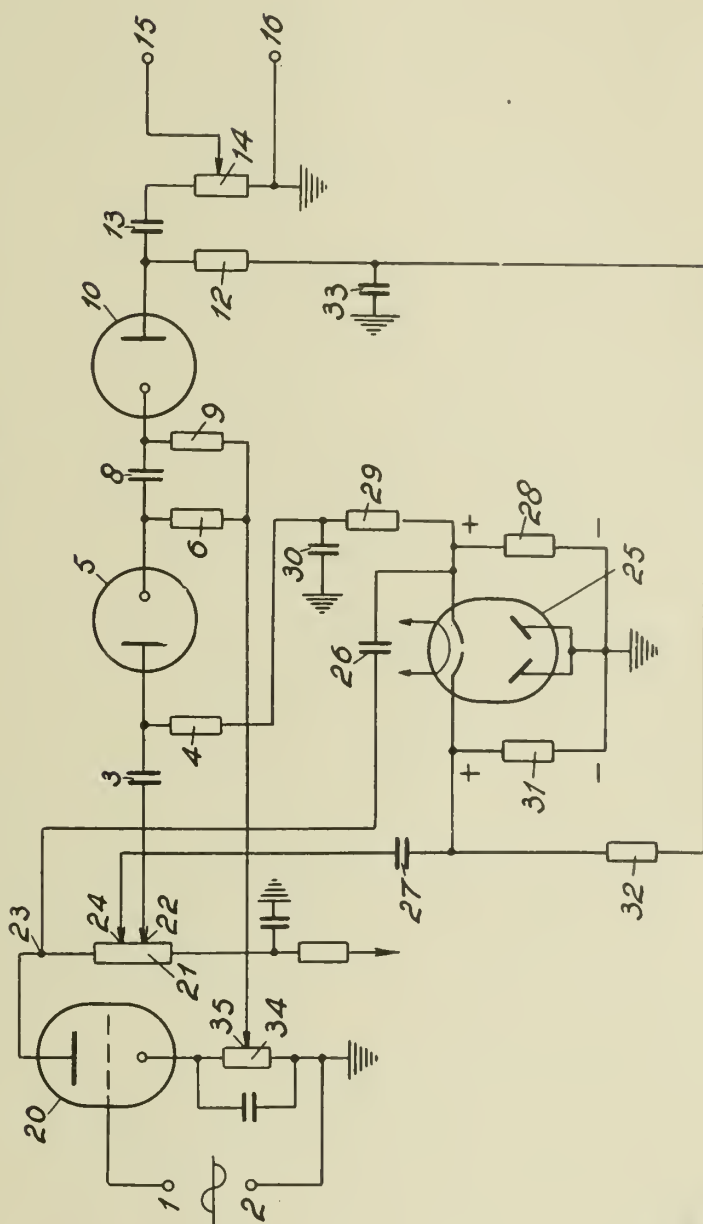
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Serial No.

326,567

5 Sheets-Sheet 2

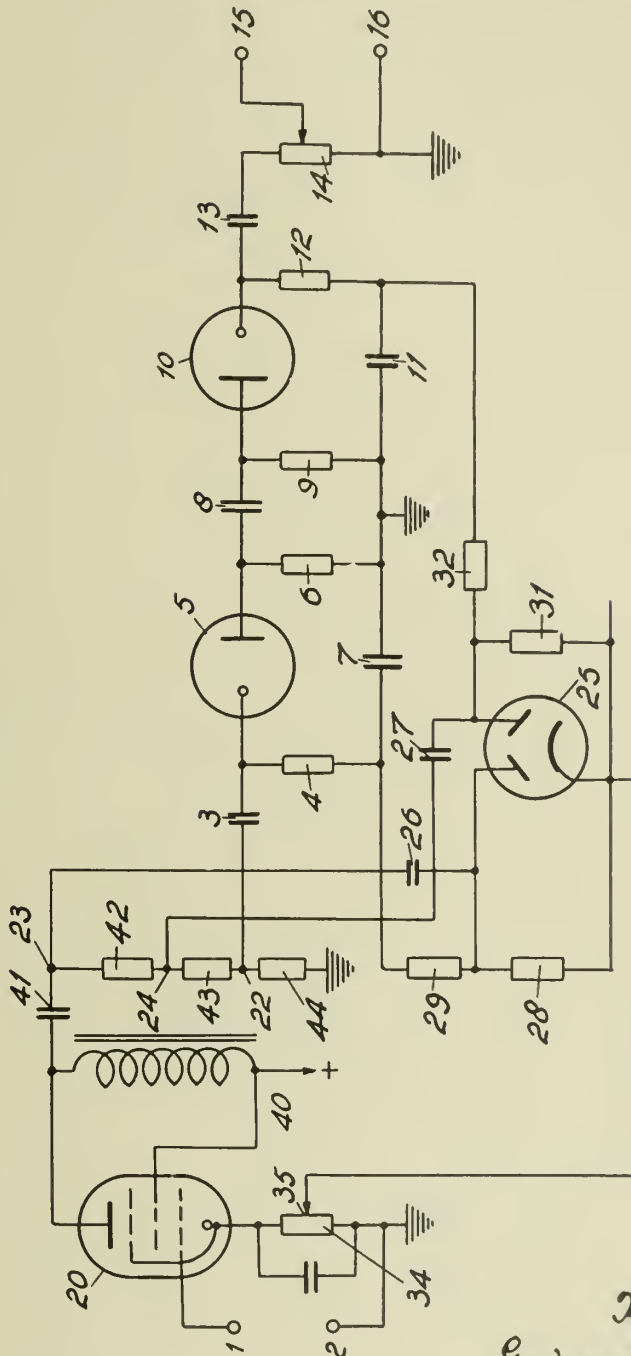
FIG. 3



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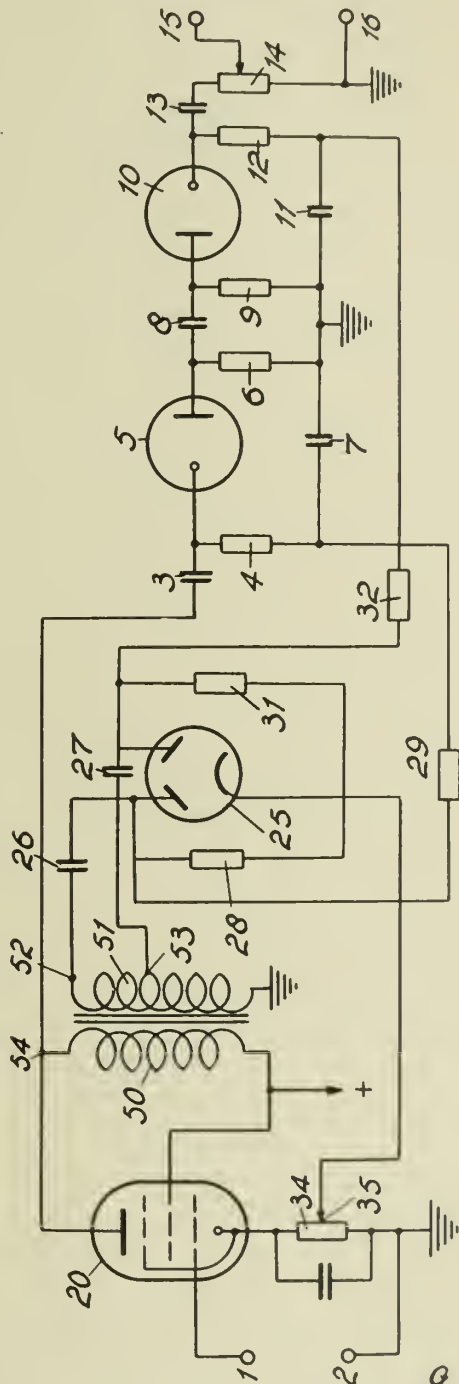
FIG. 4



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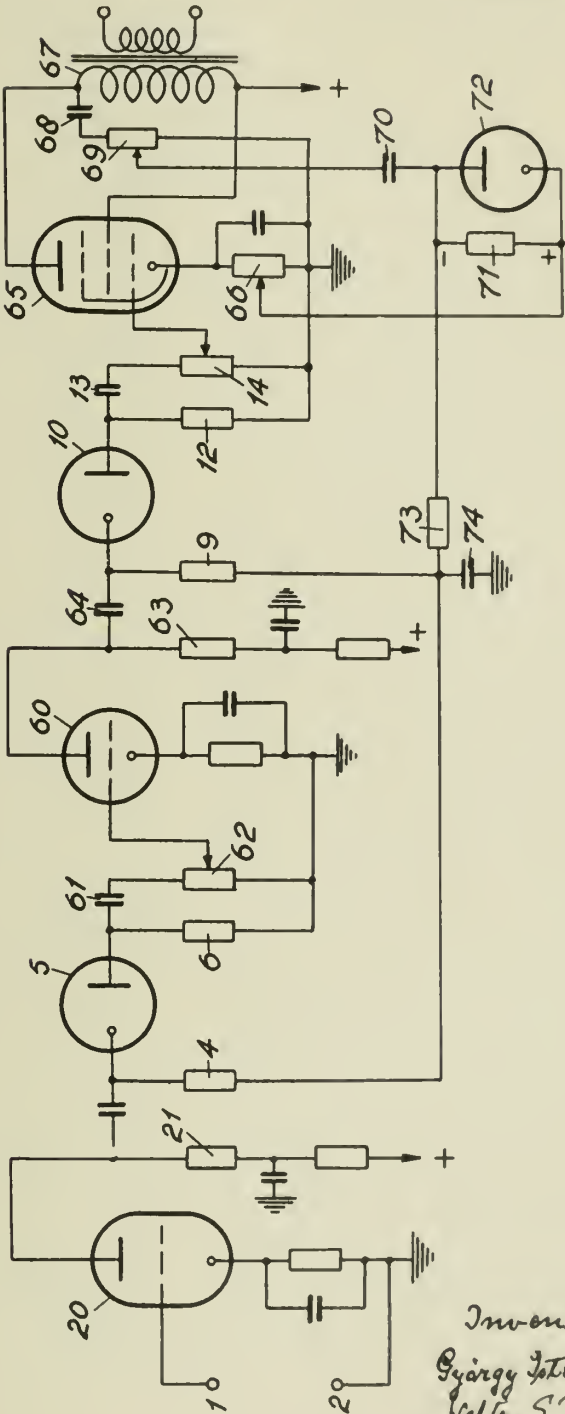
FIG. 5



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FIG. 6



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# ALIEN PROPERTY CUSTODIAN

## TELEVISION DISSECTORS

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Application filed March 29, 1946

This invention relates to television dissectors, that is, devices in which an electron beam is caused to sweep over or scan an image produced on a mosaic of minute photo-sensitive elements, whereby picture currents or signals appear in an output circuit. The invention has for its object to increase the sensitivity of these devices, as will be understood from the following description, reference being had to the accompanying drawing, in which

Fig. 1 is a diagrammatic view showing the principal features of one embodiment of the invention, Fig. 2 illustrates an equivalent circuit arrangement referred to in explaining the function of this embodiment.

As will be seen from Fig. 1 an optical image is projected on a screen M of mosaic elements and is scanned here by means of an electron beam S. As is well known the scanning operation is as follows: As soon as the scanning beam S strikes a non-illuminated mosaic element the potential thereof rises so as to acquire a positive value of about 3 volts over the accelerating electrode A. After the beam has moved from such element the potential of this slightly decreases during the picture scanning period. The decrease is effected by electrons which return from a space charge formed in front of screen M in consequence of the emission of secondary electrons, these constituting a multiple of the primary or bombarding current effective as beam S. Depending upon the magnitude of this beam current the potential of the element decreases, acquiring a value that is slightly positive, being equal to or lower than the potential of the electrode A. When beam S impinges upon an illuminated mosaic element the potential thereof likewise rises instantaneously. This potential is changed to the same positive value as acquired by a non-illuminated element, but is not caused by the emission of photo-electrons to decrease as intensely as in the event of no illumination. Thus, in the case of an illuminated element when again scanned the rise in potential or the recharging quantity will be smaller than with a non-illuminated one. This different behaviour of a non-illuminated element as compared with an illuminated one entails the origination of the picture signal in consequence

of the fact that at this instant there will be less electrons returning to the electrode A while at this time the charging quantity of the entire mosaic is varied in the negative sense. As is well known an odd number of amplifying tubes is required for the subsequent amplification so that in the event of illuminating a mosaic element the negative signal produced by means of the transmitting tube here shown shall cause an illumination to arise in the receiving Braun tube.

According to the invention these fluctuations of the current passing toward the accelerating electrode A are increased by a sort of feedback or reaction coupling.

In the case represented in the drawing the picture signals of a voltage  $e$  are conveyed from the output circuit of the amplifier V to the electrode A in the proper phase. This amplifier comprises grid-controlled amplifying tubes. Whenever the current toward A decreases then the negative potential applied to A adds to this decrease, whereas in the event of an increase of this current, such increase being due to a dark point of the mosaic, an additional increase is effected by a rise in voltage. In this way it is possible to intensify the variations or the modulation of the accelerating current and thereby to amplify the picture signals.

In the equivalent circuit shown in Fig. 2 the feedback or retroactive voltage is applied to point 1. Condenser  $C_1$  represents the capacity between accelerating electrode and the mosaic elements, condenser  $C_2$  represents the capacity between the mosaic elements and the so-called impulse or signal plate Q, Fig. 1, and R denotes the input resistance of the amplifier V.  $C_3$  represents the capacity of the input circuit. When applying the picture voltage  $e$  to the point 1 a voltage division takes place which causes the input circuit of the amplifier to be considerably overmodulated. In order to prevent this a neutralization arrangement is provided in which the picture voltage, dephased by  $180^\circ$ , is at point 2 and over a condenser  $C_4$  supplied to the first or input grid of amplifier V. This auxiliary arrangement when properly balanced will be suitable to obviate disturbances.

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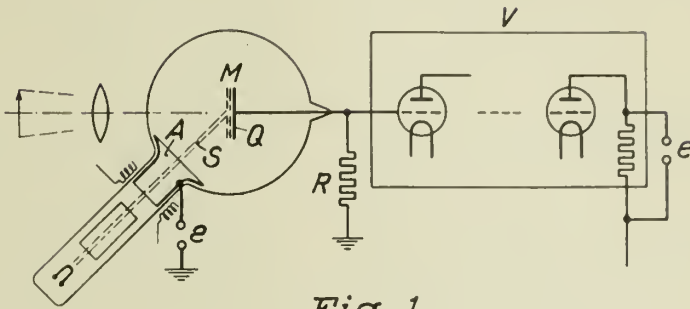


Fig. 1

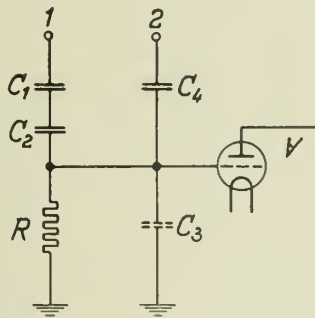


Fig. 2

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# ALIEN PROPERTY CUSTODIAN

## FIRE-ALARM SYSTEMS AND IN DETECTORS OF RADIO ACTIVE MATERIALS

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France; vested in the Alien Property Custodian

Application filed March 29, 1940

This invention is for improvements in or relating to fire alarm systems and detectors of radio active materials.

Fires are generally detected by devices which respond to a rise of temperature. Systems including such devices of necessity only detect the fire after some damage has been caused which may be considerable and, in order to reduce the damage to a minimum, it is necessary to employ a comparatively large number of such alarm devices over a given area.

The use of fire detection by the light emitted by the conflagration has been restricted in view of the fact that it is necessary that such systems should not be unintentionally operated for example by daylight, artificial light and the like.

The present invention obviates such a possibility and also the necessity of producing very sensitive detector systems actuated by the light emitted by an incandescent fire, without it being set in operation by normal sources of light, or by daylight.

The present invention consists in employing the property inherent in unprotected flames of emitting to some distance (for example 2,200 to 3,000 A. U. or more) considerable quantities of ultra-violet radiations of which the ordinary sources of illumination are devoid owing to the ultra-violet rays being absorbed by the glass of their globes and in the case of daylight to the solar ultra-violet being absorbed by the terrestrial atmosphere. The detector system comprising the present invention will be only sensitive to the ultra-violet emanations. Finally the system is designed and constructed in such manner that the ultra-violet reception by the system is expressed by a system of discharges of comparatively high frequency which are employed by any known system to operate a desired relay.

The detector according to the present invention is of a type employing the properties of the discharges in comparatively high gaseous pressures. It is composed essentially of a meter tube, the major portion of which may be of glass for convenience of manufacture but which is provided with a window of quartz; it contains a photo-cathode constituted of an only slightly electro-positive element (ferrous metal such as nickel or a metal of the platinum group, or an alloy, or a chemical compound such as an oxide of these bodies, or the like) carefully freed from hydrogen in order that the photo-electric element is responsive to ultra-violet emanations and render the apparatus insensitive to normal artificial light or to daylight. If need be, the light can be

filtered by a Wood glass thereby eliminating the radiations contained in solar light or the undesirable radiations proper to the installation to be protected.

The tube contains a mixture of rare gas and oxygen at a pressure in the vicinity of one tenth of an atmosphere; it also contains an anode for the passage of the discharges.

There could also be employed a device incorporating a filling of hydrogen at a suitable pressure; in this case use should be made of a suitable filter to allow the passage of radiations of short wave length.

The invention will be more particularly described with reference to the accompanying drawings, in which:—

Figure 1 illustrates one embodiment of the present invention comprising a cylindrical tube,

Figure 2 illustrates a modified form of tube to that illustrated in Figure 1, and

Figure 3 illustrates a circuit arrangement in which either of the tubes illustrated in Figures 1 or 2 may be employed.

Referring to Figure 1 of the drawings, a cylindrical tube comprises a central median part transparent to ultra-violet light. The tube contains a cathode cylinder 2 a part of which is constituted by a grid 3. A fine anodic axial wire 4 is stretched by springs 5 mounted in holder tubes 6. The electrodes are for example made of platinum carefully purified of any traces of hydrogen and the photo-electric portion of which is at a distance sufficient for the system to be sensitive to the ultra-violet rays only at a distance from the unprotected flames. Nickel is also suitable. A system of this nature gives at the reception of each ultra-violet photon (or of greater frequency) a very short discharge if the source of supply is suitable. In darkness or in daylight the system is only traversed by a small number of discharges per second caused for example by the cosmic rays or the radio-activity of its surroundings. As soon as it is subjected to the light coming from an unprotected flame, the number of discharges per second increases considerably, for example up to 10,000 or 20,000, and it is this phenomenon which is employed to detect the flame. The sensitiveness of the system is considerably higher than that of an ordinary photo-electric cell and may be employed directly with the arrangement illustrated in Figure 3, without any amplification: Voltage values are given on the drawing.

The same advantages may be obtained with a tube of the shape illustrated in Figure 2. In this

construction the quartz transparent body 1 is of a cylindrical shape with a hemispherical end. The axial wire 2 serves to deposit on its internal surface, by thermal or cathodic evaporation, a semi-transparent photo-sensitive cathodic layer. The electric contact with this deposit is obtained by a metallic wire attached to the glass 3 by means of a silvered or aquadag ring 4. The wire 2 serves as an anode; the tube is filled with rare gas and oxygen at the same pressure as that given for the tube illustrated in Figure 1.

Figure 3 represents the employment of the embodiment illustrated in Figure 2 with a circuit arrangement employing a pentode.

The anode 7 of a pentode 8 is connected directly to the anode 2 of the detector 1 and also to a source of high tension (300 to 1000 volts) through a high resistance 10, for example 4 megohms. A control grid 9 of the pentode 8 is connected to the cathode 3 of the detector 1 and also to a source of polarisation through a very high resistance 11, for example 10 megohms. A screen 10 is raised to a normal positive potential such as 100 volts. When the detector 1 is at rest, the pentode is only traversed by a very feeble current. When the detector receives a photon (for example a cosmic ray) a discharge takes place between the anode 7 carried to a high potential and the cathode; the anode potential drops whilst at the same time the potential of the control grid rises in consequence of the development of a positive potential in the grid resistance; the pentode is traversed by a current impulse corresponding to the amplification of the pentode and the detector is extinguished; each photon thus gives a very brief impulse and a listening device located at 8 will indicate a shock. Thus the described system, placed in the shade or in daylight or in a normal artificial light such as that of an incandescent lamp, will indicate a series of irregular shocks, for example 40 per second. But if the detector is subjected to the light of a bare flame the number of shocks be-

comes very great (for example, several thousands); the telephone receiver will give a buzzing noise due to this frequency and a micro-ammeter located at 9 will register an increase of mean current which may be from a few micro-amperes to thirty or fifty. A relay 12 placed at the same point may be actuated by this current and set any desired system in operation. An idea of the sensitiveness of the apparatus may be given by stating that the phenomena above described are caused by the flame of a match placed a few metres distant.

If necessary, amplification by any usual system such as thyatron relays could be used.

The detectors above described can be used wherever it is necessary to detect bare flames, fire in residences, automatic surveillance and localisation of forest fires, use in mining galleries and the like.

On the other hand the apparatus only requires supplies of little importance, the whole thus forms a very compact block which is easy to shift. As the detector is equally sensitive to photons of very great energy such as  $\gamma$  and other rays, the apparatus described, mounted in this way will be usefully employed in prospecting for radio-active materials either in galleries or pits or even in the sea by making a water-tight apparatus.

The apparatus may also be employed in hospital work where radium is used. This extremely expensive material is generally enclosed in needles or tubes which are easily lost in the dressings where it is disagreeable and painful to look for them. The apparatus according to the invention will at once detect an infinitely small mass of radium among a large amount of other material.

Finally the apparatus easily lends itself to quantitative measurements of radiant sources, by the previous calibration of the micro-ammeter inserted in the plate circuit.

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PUBLISHED  
MAY 18, 1943.  
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FIRE-ALARM SYSTEMS AND IN DETECTORS OF  
RADIO ACTIVE MATERIALS  
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Fig. 1

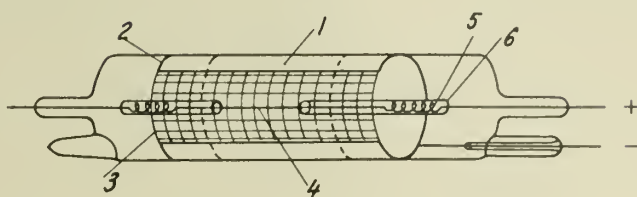


Fig. 2

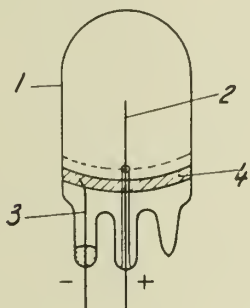
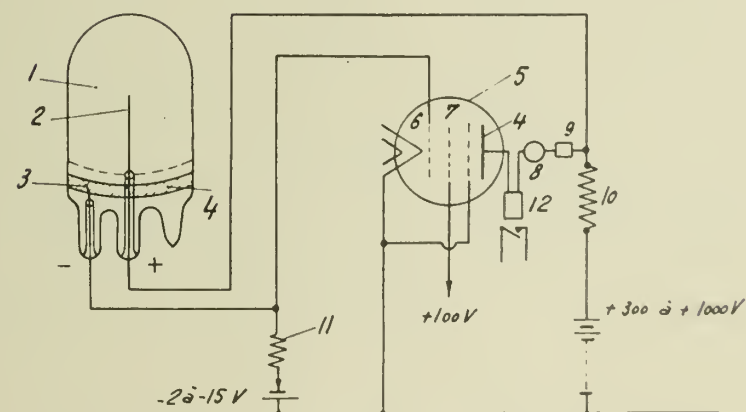


Fig. 3



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# ALIEN PROPERTY CUSTODIAN

## PROCESS FOR THE IMPROVEMENT OF ELECTRICAL CONTACT CONDUCTIVITY IN APPARATUS FOR ELECTROLYSIS OF FUSED SALTS

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in the Alien Property Custodian

No Drawing. Application filed March 29, 1940

My invention relates to a process for the improvement of electrical contact conductivity at carbon or graphite electrodes, and more particularly, to the improvement of electrical contact conductivity in apparatus for electrolysis of fused salts.

It was observed that carbon electrodes, especially graphite electrodes, show the disadvantage that after good operating in the beginning the contact resistance at the current contacts to the electrodes increases considerably. These disadvantages may not even be avoided by making the contact areas at the current connections extraordinarily large. Now it was found that this very disadvantageous rise of resistance which causes not only substantial current leakage but also a strong stress of anodes and bus bars is due to the fact that the anodically evolved gases (formed gases), especially chlorine, diffuse through the pores of the electrodes and obstruct the current passage at the contact points between the current contacts and the electrodes. This observation is object of the new invention which relates to a measure which prevents or decreases the diffusion of the anodic gas, especially chlorine, to the current connections.

In carrying out my invention the carbon or graphite electrodes are impregnated with substances which are chemically resistant against the anodic gases as well as refractory. Moreover, these substances also secure a nearly gas tight protection of the electrodes. Thus it is possible, for instance, to impregnate the electrodes or at least the points of the electrodes between the electrolysis cell and the current con-

nection with chlorinated oils or chlorinated hydrocarbons. The electrodes may be subjected to a subsequent treatment with sulfuric acid. If preferred, similar advantages are obtained if the electrodes are impregnated with sugar syrup or other carbohydrate containing solutions such as cellulosic ethers, whereafter a treatment with sulfuric acid or other carbonizing substances such as phosphoric acid or zinc chloride may follow.

In accordance with my invention the electrodes may be washed with inert gases in the neighbourhood of the electrical contacts. Inert gases are, for instance, nitrogen, carbondioxide, flue gases or the like. I prefer to rinse the graphite electrodes in such manner that a mixture with the gases of the electrolysis is prevented.

The above described effect was surprising for even if it was perceived that the increase of resistance was caused by the chlorine diffused to the current connections, it was not to be foreseen that this disadvantage could be eliminated by such simple methods as shown in this invention. In fact, these simple new methods secure a good current passage and, in consequence thereof a remarkable increase if the stability of the electrodes.

My invention may be utilized either with carbon or graphite electrodes, so-called Söderberg electrodes or the like, used either in apparatus for aqueous electrolysis or, more particularly, in apparatus for electrolysis of fused salts.

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# ALIEN PROPERTY CUSTODIAN

## ELECTRIC CIRCUIT FOR MOTOR VEHICLES

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Application filed April 4, 1940

This invention relates to a lighting plant for motor vehicles driven by combustion engines, of the type comprising a light dynamo or electric generator regulated to maintain constant voltage and supplying the head lamps and the battery, and a light switch by which the intensity of the head lights can be varied to meet, for instance, day-time and night-time conditions, between zero and parking light, bright light, dim light etc.

It is an important object of the present invention to provide means, in a plant of the type referred to, by which the voltage available at the terminals of the head lights can be maintained constant under any conditions, independently from the charging conditions of the battery and the distance from the light switch to the head lights.

With this and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawing, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to one of its practical forms, as illustrated in the accompanying circuit diagram.

The invention, in a broad aspect, contemplates, in combination, the provision of means for adjusting the voltage regulator for the electric generator, by means of said light switch, to produce a lower voltage in the "night" position of the light switch than in the "day" position thereof, and the provision of an electromagnetic switch or circuit breaker under control of the light switch, to permit the current to flow from the generator directly, through said electromagnetic switch, to the head lights, without taking the detour through the light switch on the switch board of the driver. In this manner, it is possible to supply to the head lights a substantially constant voltage which practically is not influenced by the charging conditions of the battery, with a minimum voltage drop.

Referring now to the drawing in greater detail, it will be noted that the plant comprises a light dynamo 1 including a field coil 2 and, in series therewith, a resistance 3 that can be short-circuited by an electromagnetic voltage regulator 4 which in turn includes a normal voltage coil 5, an additional voltage coil 6 having a magnetising effect assisting that of coil 5, an armature 7 and two regulator contacts 8, 9. Inter-

polated between the light dynamo 1 and a battery 10 is an electromagnetic charging switch 9.

Provided on the front side of the motor vehicle are a pair of bright head lights 11, 11 for road illumination in the open country and a pair of dimmed or city head lights 12, 12. Advantageously, two-filament dimming lamps of the type known, for example, under the trade name of "Bilux" lamps are used for this purpose, one bulb of this type being installed in each main head lamp. For the sake of clarity the additional sources of light usually present on a motor vehicle, such as, parking light, tail light, additional search light etc. have been omitted.

The circuit is controlled by an electromagnetic switch 13 comprising two voltage coils 14 and 15 magnetising their core in the same sense, as well as an armature 16 whose contact 17 cooperates with a contact 19 on a contact spring 18. Moreover, a double contact 20 on the spring 18 cooperates with two stationary contacts 21, 22.

Mounted in the reach of the driver, for example, on the switch board, is a light switch 23 including a contact cylinder 24 provided for four switch positions, viz—0, I, II and III which are 0 "all off", I "driving in daylight", II "Parking by night" and III "driving by night". The contact cylinder 24 has a plurality of contact segments mounted on its circumference and partly covered with insulating material, as shown, for cooperation with stationary contacts 25 and 26. The contacts provided on the light switch for other purposes besides the head light switching are not shown in the drawing. A dimming switch 27 to be operated from the driver and including a contact 28 serves for switching over from bright to dim light and vice versa. The open position as shown is for bright light and dimming is effected by closing the contact 28.

In the position as shown in the drawing, the light switch 23 is set for "day-time driving". In this case, the contact 26 engages an insulating segment, and the connection to the two coils 14 and 15 of switch 13 is cut off. As a result, the switch 13 takes up the position indicated in the drawing, interrupting supply to the head lamps 11, 11 and 12, 12 and interrupting the connection to the coil 6 of the voltage regulator 4. In this condition, the regulator 4 is influenced merely by the coil 5 and, by periodically switching on and off the resistance 3, regulates the voltage of the generator to a value of, say, 7.5 V, thus ensuring full charging of a three-cell lead battery by day-time driving.

In the "night-time driving" position of the

light switch 23, the two contacts 25 and 26 are interconnected by the conductive portions on the contact cylinder 24, thus closing the circuit of coil 15 of switch 13. Supposing the dimming switch 27 is open, the coil 14 of switch 13 is switched off. The magnetic flux generated by the coil 15 causes attraction of the armature 16 to such an extent that the contacts 17, 19, are closed, while the contacts 20, 21, of the contact spring still remain closed. Consequently, the two head lamps 11, 11 are connected to the battery 10, or, with closed charging switch 9, to the generator 1. At the same time, coil 6 of regulator 4 is connected, through the cable leading to the contact spring 18, and the contacts 19, 17, with the battery 10. Hence, the regulator 4 is now influenced by the two coils 5 and 6 and regulates the voltage of generator 1 to assume a lower value than with day-time driving, namely, the nominal tension of the incandescent lamps of the head lights, say 6,75 V. This voltage is reached very soon by the generator 1, even if the battery 10 should have been discharged down to a very low value.

In order to dim the head lights, the contact 23 of switch 27 is closed, whereby the coil 14 of switch 13 is connected to the body of the vehicle. Owing to the additional magnetisation effected by the coil 14 the armature 16 is now attracted with greater force, removing contact spring 18 from contact 21 and pressing it against contact 22, while the pair of contacts 17, 19 remain closed. The bright lights 11, 11 are now switched off and the dim lights 12, 12 are connected to the battery 10, or to the generator 1, respectively, the circuit of the regulator coil 6 remaining unchanged for regulation of the generator to a voltage of 6,75 volts.

By opening the dimming switch 27 the head

lamps may then be switched back to bright light.

It will thus be understood that the generator is regulated to produce a lower voltage in the "night-time driving" position of the switch than in the "day-time driving" position thereof, and the head lamps are supplied with the nominal voltage for which they are provided. As soon as the generator starts charging the battery, the head lamps will receive a constant voltage corresponding to their nominal voltage, independently from the charging condition of the battery, so that variations in the light intensity of the lamps are prevented. Owing to the low voltage of the generator the charging current supplied to the battery cannot grow to excessive figures, and, as a result, overloading of the generator is avoided in spite of the additional load produced by the head lamps.

Sufficient charging of the battery is ensured by the fact that the generator is regulated to produce a considerably higher voltage at day-time driving.

It will be seen from the drawing that the electromagnetic switch 13 which is controlled by the light switch 23 permits a direct connection on the shortest possible path between the head lamps and the generator, thus avoiding the supply cable to be passed over the light switch 23. Hence, any voltage drop that would be caused by the length of cable required for this connection, by the light switch etc. is avoided.

The apparatus of the present invention has been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

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BY A. P. C.

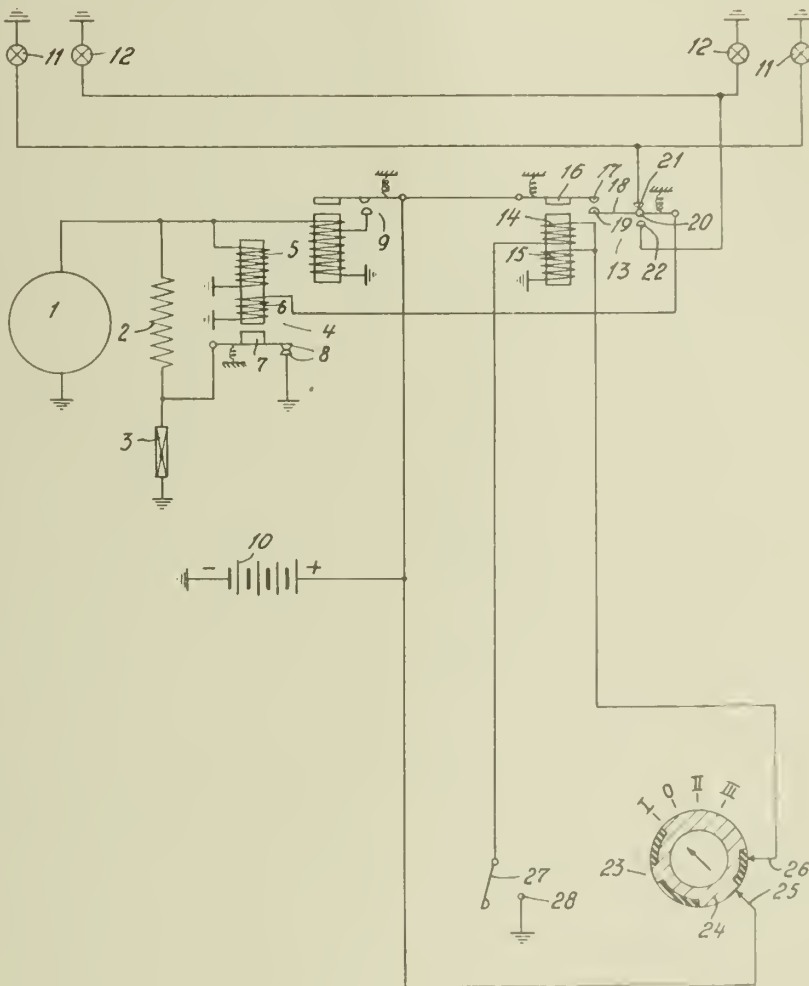
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ELECTRIC CIRCUIT FOR MOTOR VEHICLES

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# ALIEN PROPERTY CUSTODIAN

## TYPE FOR TYPEWRITING MACHINES, PERFORATION OR PRINTING AS WELL AS INTERPRETATION SYSTEM FOR CHARACTERS

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Application filed April 5, 1940

The present invention mainly has for its object a type for typewriting, perforating or printing, by means of which it is made possible to produce characters which are particularly adapted for accurate mechanical interpretation, for instance by means of photocells or contact springs.

In order to obtain this the types are so formed as to produce by their engagement with the writing surface a picture composed of a number of fields following after each other in the direction of reading, each field comprising transversely to the direction of reading a transparent or translucent, or light reflecting part and an opaque or non light-reflecting part.

Each character will accordingly comprise a rectangular surface, consisting of two adjacent strips lying in the direction of reading, said strips being divided in the direction of reading in dark or light fields in such a manner that a dark field in one strip will always correspond to a light field in the other strip and vice versa.

The number of characters which may be produced by means of types of the above mentioned form as it will be understood are  $2^n$ , where  $n$  is the number of the double fields comprising a light and a dark section following each other in the direction of reading.

For recording the letters of an ordinary alphabet accordingly a character composed of five double fields following each other in the direction of reading will be sufficient.

The types according to the present invention may be printing types by means of which the dark fields are produced by blackening or perforating types, by means of which the light fields are produced by perforation.

In both cases the mechanical interpretation of the writing produced by means of the type may be carried out by means of two co-operating photocells to which light is supplied by means of a suitable optical system from a source of light under which the characters are moved in the direction of reading so that when one of the transverse double fields is exposed to light from the source of light, light will pass through the translucent or transparent part of the double field to one of the photocells, whereas the other photocell is not being illuminated.

By using two co-operating photocells in this manner errors in interpretation are avoided, the photocells being so connected that they transmit an electrical impulse only in case one of the cells is illuminated and the other not.

Instead of using photocells for producing electrical impulses by means of the double fields of

the characters, it is also possible when the characters are produced by perforation to use a pair of co-operating contact springs which act in the same manner.

When a character by means of a type of the above mentioned kind passes below the interpretation device consisting of two co-operating photocells or contact springs, there will be transmitted by means of one of the photocells or one of the contact springs a number of impulses, each character corresponding to a certain characteristic sequence of impulses.

In order to cause this sequence of impulses to actuate a certain recording member (for instance the type arm of a type-writing machine, a linotype-machine or the like) the impulse transmitting photocells or contacts co-operate with a controller, the movement of which is synchronized in such a manner with the relative movement between the system of photocells and characters that it transmits each of the sequence of impulses to different stages of an automatic selector of a conventional type.

In this manner each sequence of impulses transmitted through the interpretation system is caused to close the current circuit selected by means of said sequence of impulses, said current circuit serving to actuate the recording member for the character corresponding to the sequence of impulses.

It is preferred to use two controllers of the kind specified, adapted to be cut in alternately so that one controller effects the transmission of the sequence of impulses corresponding to one particular character during which time the other returns to its starting position.

The types in accordance with the present invention may be combined with types for ordinary letters or characters so that the ordinary letter or character as well as the character produced by the new type are transferred to the writing surface. For instance types in accordance with the invention may be combined with ordinary typewriter types so as to apply the new characters on the sheet above or below the ordinary types. In the case of perforation types these may also be arranged so as to perform perforations in the field covered by the ordinary characters.

Instead of using a type in accordance with the invention for each character which it is desired to reproduce, the types in accordance with the invention may also be formed by the necessary number of type sections, arranged one after the other in the direction of reading, said sections

being adapted to be adjusted transversely to the direction of reading in order to produce the dark or light field in one or the other of the two positions necessary to form the impulse combinations.

The relative displacements of said type sections may then be caused by means of an ordinary keyboard, the keys for each of the ordinary characters being adapted to actuate one or more levers causing the displacement of the separate sections of the special type.

In the following some forms of the invention will be described with reference to the diagrammatical drawings.

Fig. 1 is a picture of the printing surface of types in accordance with the invention corresponding to the characters usually found in an ordinary typewriting machine.

Fig. 2 is a perspective view of part of a machine type which is provided besides the ordinary characters with the new characters in accordance with the invention located above the ordinary characters.

Fig. 3 is a perspective view of part of a machine type provided with ordinary characters and perforating types.

Fig. 4 is a diagrammatic cross section of an interpretation device with two photocells.

Fig. 5 is a diagrammatic perspective view of a synchronizing device for two controllers.

Fig. 6 is a circuit diagram for an interpretation device with two photocells and two controllers.

Fig. 7 is a diagrammatic side view of the adjusting device for the separate sections of a composite special type.

On Fig. 1 there is illustrated a printing surface for a set of 32 types with indications of the characters which they represent.

Fig. 2 is a perspective view on an enlarged scale of a machine type carrying the letters *a* and *A* and with the new type corresponding to *A* placed immediately below the normal letters.

When typewriting is carried out with such types the new characters adapted for automatic interpretation will be located in the spaces between the lines on which the ordinary characters are found.

In the machine type illustrated in perspective view on an enlarged scale on Fig. 3 perforation types in accordance with the invention are so placed that they cover the normal letters *a* and *A*, and when this kind of types are used there will be produced a perforated writing in accordance with the new type system on the same line as the ordinary characters.

Fig. 4 illustrates by means of a diagrammatic section the principle in accordance with which the interpretation of characters produced by the new types may take place.

1 is a source of light, 2 a conventional optical system and 3 a translucent or transparent disk over which a strip provided with writing produced by the new types is moved in a direction perpendicular to the picture of the surface of the drawing.

4 is a system of prisms by means of which race of light passing through the transparent or translucent parts of the characters are directed either against the photocell 5 or the photocell 6 according to whether one part or the other is adapted to let the light come through.

Fig. 6 illustrates diagrammatically how the two photocells 5 and 6 are connected in accordance with the invention in order to produce the se-

quence of impulses corresponding to each complete character.

In accordance with the principle of interpretation by means of photocells 5 and 6 it is necessary that one or the other of said cells should always be in operation.

In case both photocells should simultaneously be in or out of operation, this means that an error has been made. Photocell 5 acts to operate relay 10 whereas photocell 6 acts to operate relay 11.

Supposing relay 10 to be energized contact spring 12 will connect the plus terminal of the battery through line 8 with line 13. Contact spring 14 remaining in its position of rest connects line 13 with controller arm 15, which is connected in its starting position through line 16 with magnet coil 17 and further with line 9 and the minus terminal of the battery. Relay 17 acts to operate two contacts one of which, 18, closes a selfclosing circuit for relay 17 from the plus terminal of battery over contacts 18 and 19 associated with contact wheel 20, so that line 8 is connected with line 21 over said contacts 18, 19 so as to close the circuit as specified to the minus terminal of battery.

In case relay 10 for photocell 5 is disconnected so that contact spring 12 interrupts the current circuit over relay 17, said relay will still be under current over the selfclosing circuit specified until contact wheel 20 interrupts the said circuit by actuating contact spring 19.

In case relay 10 is not energized and current is supplied to relay 11, a current circuit will be closed in the same manner from the plus terminal of battery over line 8 which is now connected by means of contact spring 12 with line 22 and from then over contact spring 23, which is then in its closed position connected with line 24 and controller 25. The latter in its starting position as illustrated closes the circuit through line 26 to relay 27 and from then to the minus terminal of battery. Said relay 27 by means of contact spring 28 closes the same selfclosing circuit as previously specified for relay 17.

Supposing that the contact arms 15 and 25 have moved one step in a counter clockwise direction it will be seen from the drawing that one of two current circuits must be closed, that is either the circuit for relay 29 or the circuit for relay 30. If arms 15 and 25 are in their third position, one of the corresponding relays 31 or 32 will be closed. In the fourth position one of the relays 33 or 34 and in their fifth position one of the relays 35 or 36 will be energized in the same manner.

If the arms 15 and 25 continue their simultaneous stepwise movement from the sixth to the tenth position it will be seen that current circuits will be closed in the same manner either over contact arm 15 to relays 37, 39, 41, 43 and 45 or over arm 25 to relays 38, 40, 42, 44 and 46. Relays 17, 27, 29, 30, 31, 32, 33, 34, 35 and 36 all have the same self-closing circuit closed over contact spring 19 and contacts 18, 28 as above specified as well as by further contacts 47, 48, 49, 50, 51, 52, 53, 54 as will be seen on the diagram.

In the same manner self-closing circuits are energized for relays 37—46 from the plus terminal of battery over line 8 and contact spring 55 to line 56 and over contact springs 57—66 for the respective magnets 37—46.

By this stepwise displacement of the selector arms 15 and 25, magnets 17 or 27, 29 or 30, 31 or 32, 33 or 34, 35 or 36 will be energized when the selector arms have passed the five first steps

depending on whether one or the other of relays 10 and 11 receives current by means of photocells 5 and 6.

By the further displacement of arms 15 and 25 the next five steps will close current circuits either to relay 37 or 38, 39 or 40, 41 or 42, 43 or 44, 45 or 46.

If it now be presumed that either line 67 or line 68 is connected to the plus terminal of battery, it will be seen that a current circuit is closed over one of the two sets of relays on magnets 69—100.

Presuming that in the first set of relays relays 17, 29, 32, 34 and 35 receive current from line 21 over contacts 18, 47, 50, 52 and 53 the contact springs of which are in the closed position, line 67 will be connected with the following lines: 67—101—102—103—104—105—106—107—108—109 to line 110 which is the 26th line counting from the right, leaving relay 36 and joining cable 111, the lines of which lead in the same numerical order to each of the 32 relays 69—100, counting from the right.

Thus relay 94 will be energized, this being the 26th relay counting from the right. In case the relays of the other set, that is 37, 39, 41, 43 and 45 are under current, line 68 leading to the contact sets corresponding to relays 37—46, will also be connected with line 110 which also leads to relay 94 through cable 111.

The said magnets 69—100 in a known manner may be actuated with a typewriting machine for releasing or operating the type arms of said machine.

Presuming photocell 5 to be operating in the upper part of a light ray and the photocell 6 in the lower part of the same light ray for recording characters, photocell 5, in order that the said relays, such as 17, 29, 32, 34 and 35 shall receive current, will be twice activated when photocell 6 is neutral, whereupon photocell 6 is activated twice when photocell 5 is neutral, whereupon photocell 5 is again activated whereas 6 remains neutral.

The five impulses thus interpreted will correspond to the type character S on Fig. 1. In case photocell 5 is activated in the same manner during the two first of five impulses whereby magnets 17 and 29 will receive current, whereupon the third impulse step activates photocell 6 so as to supply current to relay 32, line 67 will be connected with lines 101, 102, 103, 104, 105 and 106.

In case photocell 5 is now activated in the fourth impulse step, line 106 will not be connected with line 107 but with 112, which is again connected with line 113, and in case photocell 5 is now activated at the fifth impulse step line 113 will be connected with line 114 over relay 35 which is connected over relay 36 with line 115. Line 115 is connected through cable 111 with relay 96.

On Fig. 1 the said sequence of impulses are illustrated by means of the type indicated with the word "switch." Relay 96 consequently is not connected with any particular type arm but releases and operates a contact set for cable 111, whereby the lines, after the operation of said relay, are disconnected from the coils of magnets 69—100 and connected with other magnets. This may be up to 31 for the operation or releasing of other type arms or functions of a typewriting machine in case the 32 types illustrated on Fig. 1 should also be used for other type arms or functions of the typewriting machine.

In accordance with the embodiment forming the basis for circuit diagram on Fig. 6, the interpretation of the type characters is supposed to be transmitted to the type arms of an ordinary typewriting machine. The operation of any particular type arm also causes a stepwise movement of a contact wheel whereby contacts such as 19 and 55 as well as 117 and 118 are actuated.

The depression of any particular type key as well as the space key (the bar in front of the keyboard) as it is known releases the progression device of the typewriting machine whereby the carriage of the machine is moved one step when the key actuated is released and the type arm returns to its original position.

It will be immediately understood that besides this releasing device other movements may also be performed by the depression of a key. Thus one or more ratchet pawls may in a known manner engage the teeth of their respective ratchet wheels whereby these are moved one step by the depression of the key.

By placing one or more trailing arms in such a manner that their ends are in engagement with the disk associated with said ratchet pawls, there may be caused by means of notches or bosses on said disk to perform a movement, whereby contacts are closed or opened or in some cases remain uninfluenced during the stepwise progression.

On Fig. 6 19, 55, 117 and 118 indicate such trailing arms actuated by means of disks 20, 119 and 120. During the stepwise progression contact arm 117 will move from a notch to the top of a tooth. The contact point of the arm which on Fig. 6 engages contact spring 122 when wheel 119 has moved one step, will engage contact spring 121. The stepwise progression of contact wheel 118 accordingly will cause the plus terminal of battery to be connected at every second step with line 68 and at the intermediate steps with line 67.

Disk 120 in the same manner actuates the trailer arm 118 which is moved from notch to notch during the stepwise progression whereby contact arm 118 performs a short contact closing, whereby a current circuit is closed from the plus line 8 through contact trailer 118 and relay 123 the second coil terminal of which is connected with the minus terminal of battery. Relay 123 thus receives an impulse for each step of movement carried out by disk 120.

Disk 20 is like disk 120 provided with small teeth or bosses which when they pass trailing arms 19 or 55, lift these during their passage so that the corresponding contacts which are ordinarily closed, are interrupted for a short period during the movement. As it appears from the figure the teeth of disk 20 are placed at such distance from each other that the contacts are interrupted alternately. Thus when disk 20 moves clockwise, the first step will cause movement of contact arm 55 whereas arm 19 is moved during the next step. Accordingly the selfclosing current circuits for the two sets of relays are interrupted alternately.

Before the sequence of operation is described the synchronizing device for the paper ribbon from which the photocells receive their impulses, will be described with reference to Fig. 5. By means of relay 123 the movement of the paper ribbon is made dependent on the speed of operation of the typewriting machine.

Paper ribbon 124 is supposed to be moved in the direction of the arrow movement taking place at uniform speed past the photocells for instance

by means of a spring motor. The movement of the paper ribbon is transmitted to drum 125 on shaft 126. The movement of shaft 126 is transformed as indicated diagrammatically on Fig. 5 by means of gears 127, 129 to selector devices 15 and 25.

On sleeve 123 which is loosely mounted on shaft 126 is secured ratchet wheel 130 which is adapted to be released stepwise by means of magnet 123. Sleeve 129 is connected with shaft 126 by means of a spiral spring (not shown) which is wound by the rotation of shaft 126 when sleeve 129 is maintained in its position by means of pivot 131.

When shaft 126 has performed a rotation corresponding to a movement of paper ribbon 124 caused by the impulse steps for up to characters, that is in the present case ten impulse steps, the spiral spring will be completely wound so that shaft 126 can not be moved any further, whereby the movement of ribbon 124 stops being kept in position by pawl 131. In case magnet 123 receives an impulse ratchet wheel 130 is released.

The spiral spring connecting shaft 126 and ratchet wheel 130, moves the latter one step whereupon the ratchet wheel is again stopped by pawl 131, whereas shaft 126 is now free to rotate. The released spiral spring will again be wound until the whole stops again and is held by pawl 131 unless magnet 123 receives an impulse during this period. In this case paper ribbon 124 is moved evenly and uniformly.

The sequence of operations during the interpretation process in connection with the embodiment illustrated by diagram on Fig. 6 shall now be described.

It is presumed that ribbon 124 has been placed in front of the photocells so that the interpretation impulse of the first type is situated under the photocell combination, whereas at the same time the selector arms 15 and 25 are in their initial position.

Pawl 121 keeps the whole system locked. The carriage of the typewriting machine is now adjusted to one step in front of the place where the first type is to be printed. The battery which is adapted so as to be easily connected and disconnected is now supposed to be connected. A pressure on the space key (the bar) places the typewriting machine in operative position, whereas at the same time disks 20, 119 and 120 are moved one step. Disk 120 thereby transmits an impulse to relay 123 and paper ribbon 124 starts its uniform movement, the photocells receiving the five first writing impulses for the first type.

These writing impulses as described above are transmitted to the first set of relays, comprising relays 17, 27—36. Neither more nor less than five relays in the above mentioned set must be closed and these will remain closed, being maintained by means of the selfclosing circuit over line 21. As contact arm 117 is now connected with spring 121, the current circuit will be closed from the plus terminal of battery over line 67 to cable 111 and one of relays 69—100 for printing of the type corresponding to the character interpreted.

The paper ribbon 124 continues its uniform movement as the spiral spring between sleeve 129 and ratchet wheel 130 permits a movement of up to 10 type impulses before it is completely wound. Consequently the selector arms continue their movement from the sixth to the tenth step, current circuits over the relays in set 37—46 corresponding to the next character being closed.

During this continued interpretation one of

the magnets under the typewriting machine is actuated whereby the type first interpreted is printed and the disks 20, 119 and 120 are moved one step. Magnet 123 receives an impulse by means of which the spiral spring between sleeve 129 and ratchet wheel 130 is again released so that the paper ribbon 124 may continue its uniform movement.

Simultaneously with the impulse to locking magnet 123 contact arm 19 is moved, whereby the relays in line 21 of the first contact set are cut out and all closed magnets are demagnetized. Further contact arm 117 is moved from contact spring 121 to contact spring 122, whereby as soon as five of the magnets 37—46 in the second contact set have received current, the corresponding magnet in set 69—100 is energized in order to actuate the corresponding type of the typewriting machine.

The contact wheels are hereby moved another step whereby the magnets in the second contact set are cut out whereas the current circuit of the contacts in the first contact set will be closed as soon as five magnets in this set have again received current etc. In this manner the time necessary for moving a type against the cylinder of the typewriting machine as well as for moving the carriage one step to interpret the impulses produced by the next type is utilized.

The process of interpretation in accordance with the above mentioned process will take place with high velocity. In the case of an error in interpretation, for instance by the simultaneous illumination or non-illumination of both photocells, the five relays for the corresponding contact set will not be closed and no current circuit will be closed to one of magnets 69—100, whereby the interpretation process is interrupted.

Fig. 7 illustrates the manner in which a composite special type may be adjusted in connection with the key-board of a typewriting machine.

The special type is here composed of five pivoted type arms one of which is shown and indicated with 132. Each of the type arms 132 is provided with an element for perforation or blackening so that they are adapted by adjustment transversely to the direction of reading to form a complete type of the kind illustrated on Fig. 1.

The levers 132 are pivoted on trunnions 133 on levers 134 adapted to pivot about stationary trunnions 135. A spring 136 maintains the type arms 132 in their left hand position against a stationary stopper 137.

Levers 134 are connected by means of links 138 with levers 139, pivoted on stationary trunnions 140. Levers 139 are arranged in pairs, one pair for each of levers 134 being located on each side of the key-board and the free ends of these pairs are interconnected by means of cross bars 141 so as to form a number of U-shaped hoops which are all pivoted on the stationary trunnion 140. The cross bars 141 for each of the U-shaped hoops corresponding to the several levers 134 and 132, are provided with notches so as to be actuated by the depression of the several keys 142 in case there is no notch in the cross bar 141 directly below said key.

The depression of a particular key will therefore move one or more of levers 134, 132 into the position indicated in dotted lines and contact or perforating members of said arm 132 will then

be displaced to the lower part of the type character as illustrated on Fig. 1.

The depression of one of the keys of the typewriting machine in this manner will cause the adjustment of the special type corresponding to the type of the machine in such a manner that when the type arm 143 of the typewriting machine arrives in its striking position as illustrated in dotted lines, it will at the same time

engage the special type composed by means of arms 132 with its striking surface 144 and the character of the special type will then be printed on the printing surface immediately below the normal characters if such are employed.

Obviously the arrangement may also be used in case no ordinary types are placed on arms 143.

ROLF HOFGAARD.



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OR PRINTING AS WELL AS INTERPRETATION  
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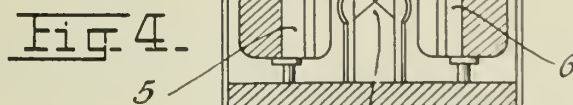
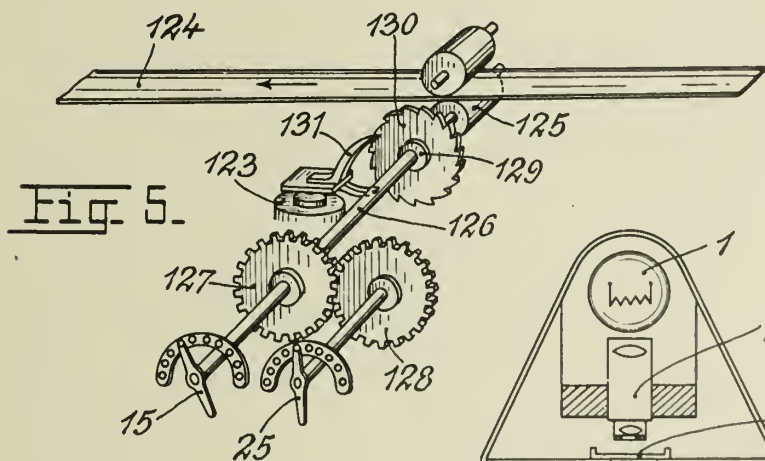
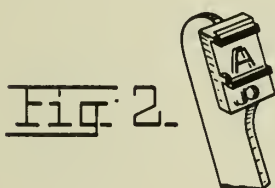
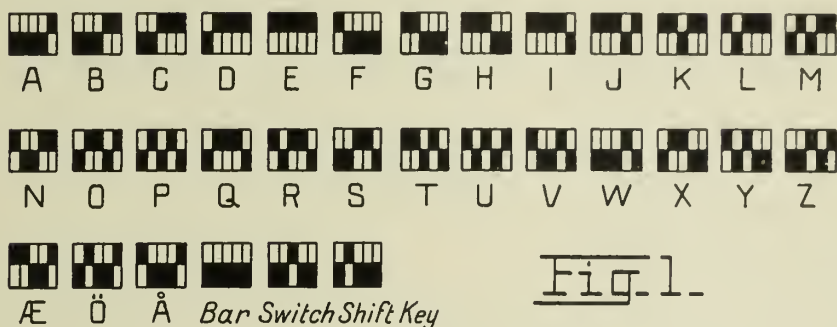
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3 Sheets-Sheet 1



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MAY 18, 1943.

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TYPE FOR TYPEWRITING MACHINES, PERFORATION  
OR PRINTING AS WELL AS INTERPRETATION  
SYSTEM FOR CHARACTERS

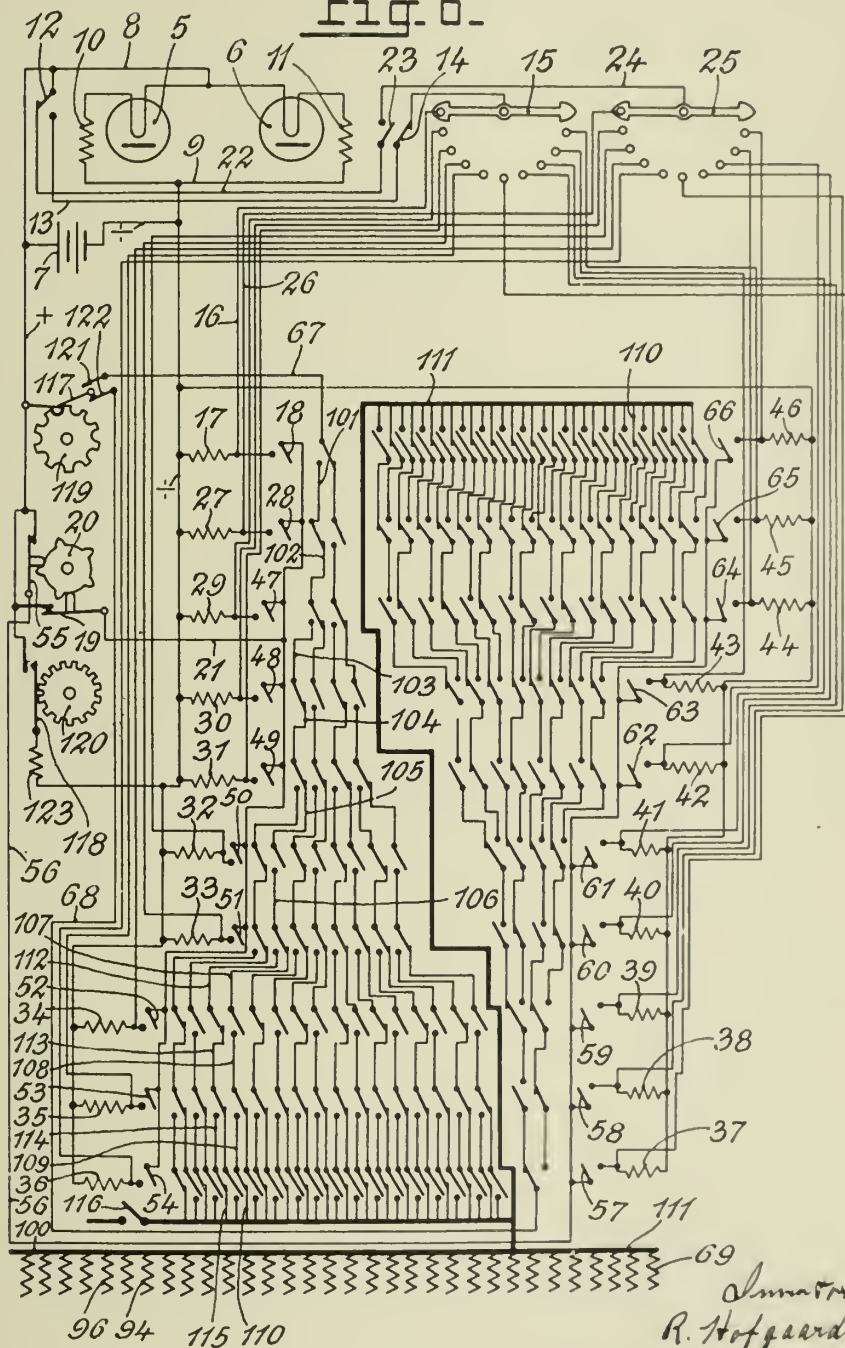
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Fig. 6.



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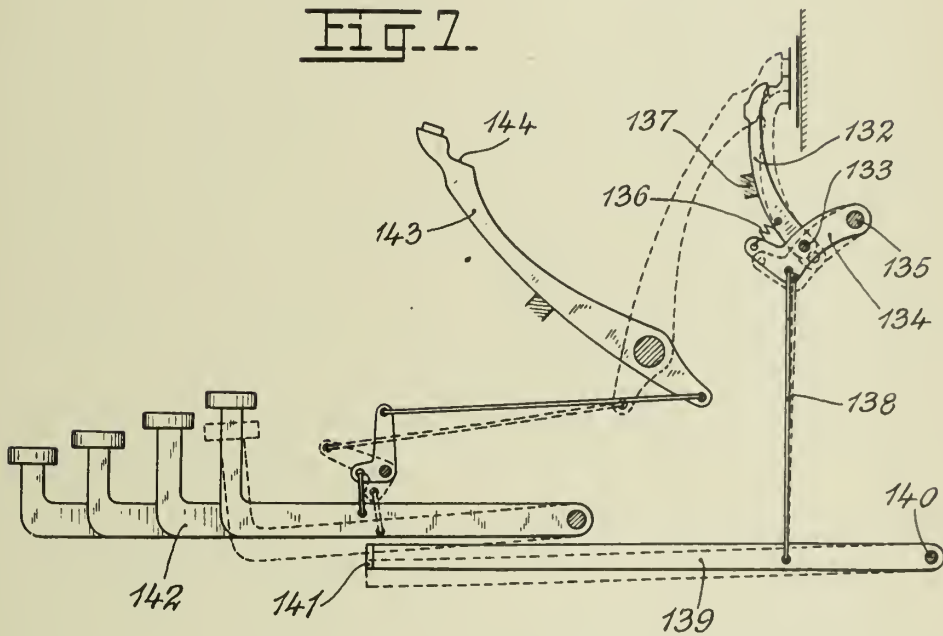
R. HOFGAARD  
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MAY 18, 1943. OR PRINTING AS WELL AS INTERPRETATION  
SYSTEM FOR CHARACTERS  
BY A. P. C.

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328,090

3 Sheets-Sheet 3

Fig. 7.



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# ALIEN PROPERTY CUSTODIAN

## METHOD AND APPARATUS FOR THE PRODUCTION OF BOILING-PROOF MOUTH- AND OPERATION MIRRORS WITH EMPLOYMENT OF A RE-SHAPABLE SUPPORT FOR HEATING WIRES

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Application filed April 9, 1940

Electrically heated mouth mirrors are known, the heating wires of which soldered on the casing are located between perforated insulating discs which, after the wires have been placed between asbestos plates, are rigidly embedded in the casing by a water-proof cement.

As the discs serve merely as lining for the mirror, they cover the wires but have no influence on the packing of the casing.

Electrically heated mouth mirrors are also known, in which the heating wires are wound around the insulating socket or support. For covering the wires an asbestos disc is also used which is securely held with the mirror in the casing by a folded over edge.

The wires branching from the winding extend through the bottom of the casing into a hollow handle equipped in known manner with contact arrangements. The mirror casing is inserted into the hollow handle. The electric wire loosely extends through the hollow handle and must be detached when the mirror is boiled. This mirror is, however, not boiling proof because the water filters through the asbestos disc and can also penetrate through the handle into the casing. A mouth mirror must, however, be absolutely boiling proof and, together with the casing, it must be not thicker than 7 mm., as otherwise it is no longer possible to insert the mirror between the molars of the upper and lower jaws.

The practical use of such mirrors shows, that inserting of the mirror into the casing is rendered difficult by a rigid insulating support when this support is fixed in the casing by a folded over edge of the casing. The mirror is put under tension by the hard support and cracks very easily. A mirror, which is fixed by a folded over edge of the casing, is further uneconomical in practice, because when the heating wires burn through it is no longer possible to insert a fresh support into the old casing.

The mouth mirror according to the application differs from the mirror of known type in that the casing is filled with pulverous material which after having been heated in the casing forms a paste which can be reshaped by means of a mold so that not only the casing is well filled but also grooves for the heating wires and for the packing ring are formed. This mass is kept in soft condition under the influence of the heated mold until the heating wires and the packing ring have been inserted and the mirror is put on and packed.

By this embedding of the support cracking of the mirror is absolutely prevented. The support

produced in this manner can be changed as it is embedded in a mica lining serving at the same time for insulating the heating wires. The aperture in the bottom plate, which allows access to the shank of the casing is attained by a boring through the mica lining at the point where the handle has to be inserted. It is also possible to pack the handle by a rubber sleeve which is inserted by stretching and threading into the open end of the bore. When released this rubber sleeve contracts and fills the interior of the handle. The wires in the sleeve and the wire between the jacket and the outer wall of the rubber tube are also tightly embedded. No water can penetrate into the casing from above, i. e. on the edge of the mirror owing to the packing ring under the mirror, whereas the penetration of water along the handle is prevented by the rubber sleeve.

The mass of which the exchangeable insulating socket consists is composed of the following substances:

		Parts
I. Refractory lacquer	-----	30
II. Stearin and natural wax in equal parts	-----	15
Filling substances		
III. Finely ground artificial resin	-----	20
IV. Asbestos flour	-----	15
V. Charcoal ash (finely ground)	-----	20

The substances I and II of the mixture are easily smeltable, whereas the filling substances III, IV and V are difficultly meltable or unmelt-able and are mechanically bound by the melting of the substances I and II.

An embodiment of the invention is illustrated by way of example in the accompanying drawing, in which

Fig. 1 shows in top plan view how the support for the heating wire is shaped by a mold,

Fig. 2 shows in top plan view the finished mouth mirror partly broken away,

Fig. 3 is a cross-section on line III—III of Fig. 1,

Fig. 4 is a vertical section on line IV—IV of Fig. 2,

Fig. 5 is a cross-section on line V—V of Fig. 2,

Fig. 6 shows in elevation the casing for the mouth mirror, the lid being lifted.

Fig. 7 shows the rubber tube on the wire.

The casing 1 of the mouth mirror has a lining 2 consisting of mica. This lining has the shape of the casing and contains the insulating support 3 in which the grooves 4 for the heating wires,

the groove 5 for the packing ring 6 and the mouth piece 7 of the handle 8 are embedded. The heating wire in the grooves 4 is designated by 9 and the wire in the rubber tube by 10. The connecting nipple of the handle 7 is designated by 11 and the connecting tube with the connecting wire for the source of current by 12, this source of current consisting for instance of a rod battery. The mirror 13 is securely held by a bent over edge 14 of the casing.

10

The mouth mirror may evidently be connected to a weak current installation. The thickness of the heating wires and the insulating of the same can be as desired, so that the mouth mirror can be heated only up to about 40° C. This temperature is sufficient to keep the mirror absolutely free from moisture.

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328,680

Fig. 1.

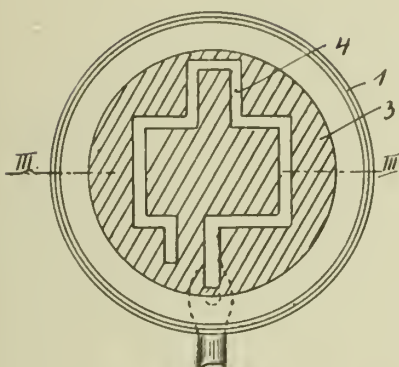


Fig. 3.

Fig. 2.

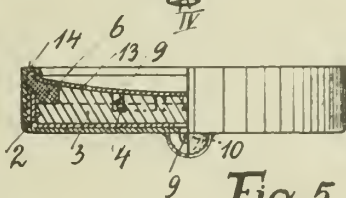
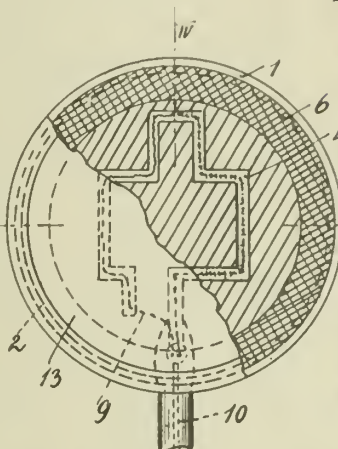


Fig. 5.

Fig. 4.

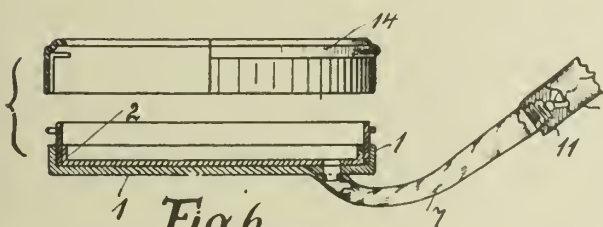
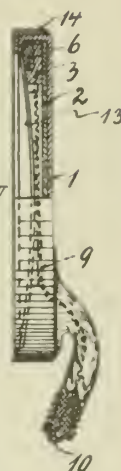


Fig. 6.



Fig. 7.

Inventors:  
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Herman Hilbert  
by *Forrest*  
Hilbert



# ALIEN PROPERTY CUSTODIAN

## ELECTRICAL DISTRIBUTION SYSTEM FOR VEHICLES

Karl Schmitt, Stuttgart-Degerloch, Germany;  
vested in the Alien Property Custodian

Application filed April 13, 1940

This invention relates to an electrical distribution system for vehicles, and more particularly to the control of the starting motor and generator in such a system.

An object of this invention is to provide a simple system for actuating the starting motor of a vehicle engine.

Another object of this invention is to eliminate a long special conductor for the starting switch of a starting motor for a vehicle engine.

Still another object of this invention is to provide a system wherein the connections for starting the starting motor of a vehicle engine are automatically broken when the voltage of the generator equals that of the battery.

A further object of this invention is to provide combined interlocked reverse current relay and motor starting switch for a vehicle distribution system.

A still further object of this invention is in providing an arrangement whereby the motor for starting a vehicle engine may be started in the simplest possible manner from the instrument panel and also by a switch in the vicinity of the engine itself.

With these and incidental objects in view, the invention consists in certain novel features of construction and combination of parts which are set forth in the appended claims and a preferred form of embodiment whereof is hereinafter described with reference to the drawing which accompanies and forms part of the specification, wherein:

The single figure shows a circuit diagram of the vehicle distribution system in accordance with this invention, and its relationship to an improved combined voltage regulator, reverse current relay and motor starting switch, drawn to an enlarged scale.

The vehicle is provided with the usual generator 1, generally mounted upon the engine in some suitable manner, and the main power source consisting of the storage battery 2. The generator 1 may be provided with a voltage regulator 3 and interconnected with the battery 2 through a reverse current relay 4, both of these devices being arranged to be influenced by the magnetization of a common core provided with suitable control winding. The armature 5 of the reverse current relay is interconnected with a holding armature 7 by means of a shaft 6, the holding armature 7 being influenced by a current coil 8 so that when the contacts 9, 10 of the reverse current relay are closed, they cannot be opened by vibration.

For indicating the charge of the generator 1,

there may be provided a device 11 in the form of a lamp interconnected between the positive poles of the generator 1 and of the battery 2. Extinction of the lamp 11 will show that charging of the generator has begun, since at that time there will be no difference in voltage between the generator and the battery.

To control the engine-starting motor 12, there is provided a starting switch 13 connected in shunt to the indicating device 11 and which, therefore, may be mounted upon the instrument panel (not shown) in juxtaposition to the control device without any special lead. Closure of the switch 13 connects the coil 14 of a starting switch between the positive poles of the generator 1 and the battery 2. Accordingly, when the engine is started and the generator 1 is producing no appreciable voltage, the voltage difference between the battery and generator will energize the coil 14 and attract the armature 15 mounted on a spring member 16 to close contacts 17 and 18. Upon closure of the contacts 17 and 18 an energizing circuit for the starting motor control may then be traced from the positive side of the battery 2, the current coil 32 of the combined voltage regulator and reverse current relay, the spring arm 16, contact 17, contact 18, spring arm 19 and then to the terminal 20 of the starting motor 12.

Since upon closure of the switch 13, the coil 14 of the motor starting switch is interconnected between the positive poles of the generator 1 and the battery 2, this coil 14 will remain energized to keep contacts 17 and 18 closed, while there is a potential difference between the generator 1 and the battery 2. However, as soon as the engine starts and the generator 1 is developing full voltage, there will be no potential difference between the generator and the battery and the coil 14 will become de-energized, despite the fact that the switch 13 may still be closed. Such being the case the armature 15 will be released, thereby opening contacts 17 and 18 and breaking the starting circuit for the starting motor. Thus the energization of the starting motor 12 is automatically removed when the motor is no longer needed.

When the generator 1 has attained the proper voltage, the reverse current relay 4 will also operate to close its contacts 9, 10 and through the holding armature 7 and the current coil 8, the relay will be held in this position so long as current flows from the generator to the battery. The shaft 6 upon which the holding armature 7 is mounted, is preferably extended to press

against the spring arm 19 of the motor starting switch and in such a manner that movement in the contact-closing direction of the armature 5 will, through the shaft 6, move the contact 18 of the starting switch away from the contact 17. Since the shaft 6 passes through an opening in the spring 16, the contact 17 will remain unaffected. Preferably suitable insulating means will be provided in the shaft 6 to prevent any current flow between the armature 5 and the spring arm 19. In this manner it is impossible to close contacts 17 and 18 while the engine is running. Additionally, the force of the spring arm 19 against the armature 5 also affects the operation of the reverse current relay so that this relay will open upon lower voltages of the generator 1. This effect is enhanced by the provision of a supplemental spring arm 21 which serves as an abutment for the spring arm 19 after it has been moved by the armature 5. Through the two spring arms 19 and 21, a progressive springing effect is produced upon the armature 5 and may be so designed that the return force upon the armature 5 will be sufficiently great for opening of the contacts 9, 10 when the generator is producing the low voltage occurring during idling of the driving engine. The forward position of the spring 21 can be adjusted by the deformable abutment 22 so that the resultant springing effect can be varied as desired. Movement of the spring arm 16 can also be varied by the use of a deformable limiting abutment 23.

For the purposes of testing and examining the engine, it is often desirable that means be provided for starting the engine at some point in the vicinity of the engine itself. Since the voltage regulator, reverse current relay and starting switch are generally mounted near the engine, I have provided such a supplemental starting switch in connection with these devices. For this purpose, the voltage regulator and control switches may be mounted within a casing member, indicated at 24, into which extends a rod 25 operable by a pressure knob 26. The end of

the rod 25 is positioned so as to be movable against the end of the spring arm 16 carrying the contact 17 and pressing the same against the contact 18. In this manner, the starting switch may be directly actuated. A suitable spring means of any character has been shown as normally maintaining the rod 25 out of contact with the spring arm 16. The casing 24 protects the entire apparatus from dirt and dust while at the same time confining any sparking action which may take place at the switches.

From the invention described above, it will be realized that I have provided an arrangement which fulfills all of the objects primarily stated. In place of circuits which require two sets of leads, one of the battery charging indicator and another for the starting switch, it is only necessary in the above described arrangement to provide one pair of leads for both. Additionally, since the current through these leads will be relatively small as compared to arrangements whereby the full starting motor current passes through the main starting switch, the leads themselves may be much smaller and accordingly much less expensive.

Furthermore, by means of the proposed arrangement, the energization of the starting motor is immediately cut out when not needed, while also the starting motor may be energized through a supplemental switch, when it is not convenient to close the ordinary starting switch on the instrument board.

The provision of a voltage regulator in the above described construction is purely optional and this may be eliminated if desired. Furthermore, the actuating coil of the motor starting switch may be placed upon the same core as the coil of the reverse current switch and of the voltage regulator provided the armature of the magnetic switch is properly polarized. This variation in construction will be at once apparent to those skilled in this art.

KARL SCHMITT.

PUBLISHED

K. SCHMITT

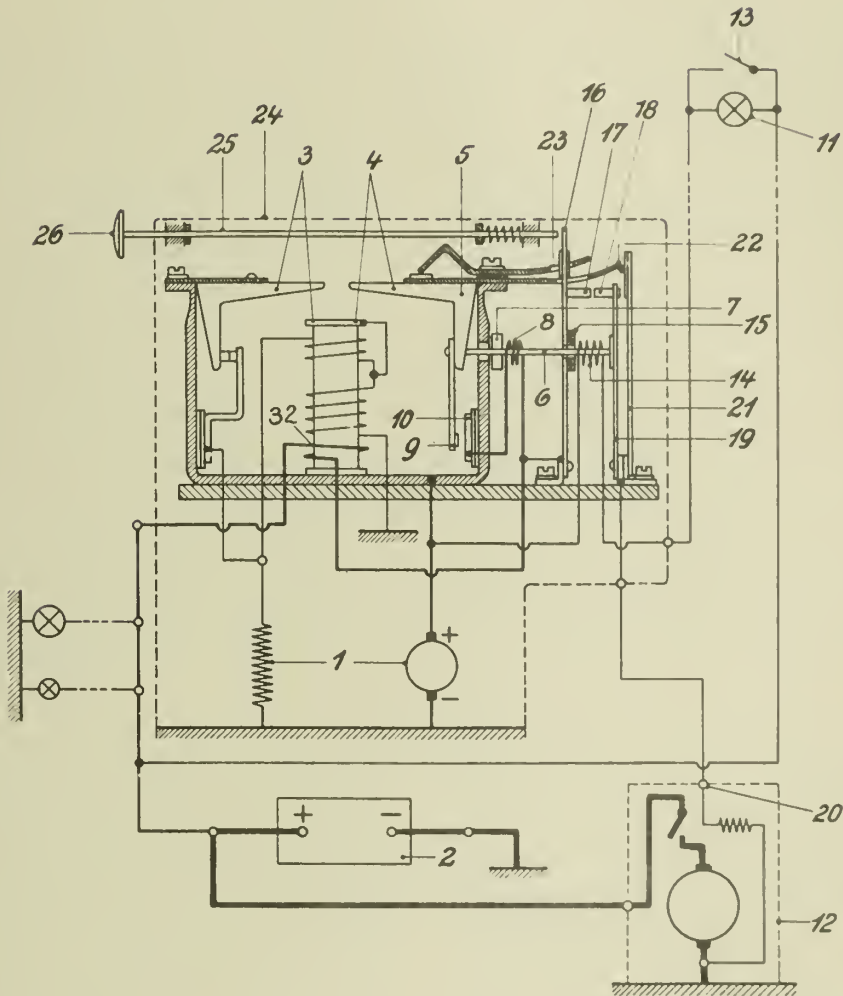
Serial No.

MAY 18, 1943. ELECTRICAL DISTRIBUTION SYSTEM FOR VEHICLES

329,575

BY A. P. C.

Filed April 13, 1940



Inventor

KARL SCHMITT  
By *A. A. Hickey*  
*Charles H. Hickey*  
Attorneys



# ALIEN PROPERTY CUSTODIAN

## RESISTANCE SYSTEM

Ernst Doetsch, Nurnberg, Germany; vested in the  
Alien Property Custodian

Application filed April 17, 1940

This invention relates to a compound resistance system or unit, more particularly, for use in excess voltage circuits.

For various electrotechnical purposes, and, more particularly, for excess voltage or overpressure circuits so called "compound" resistances are used, consisting of a mixture of conductive or semi-conductive and insulating substances, in the form of rods, discs, cylinders or plates. The data of the resistance, such as, its electric conductivity, heat conductivity, its dependence or independence from the working voltage and from changes of temperature are determined by the composition of the mixture.

It is very difficult to make large integral bodies, such as, discs, of a perfectly homogeneous mixture whose electric resistance is absolutely uniform over the whole cross section of the body. Therefore, in view of the high electrical stresses to which the compound resistances are subjected nowadays as they are tested or in practical service, it occurs in some instances that the heat produced in the resistance is not uniformly distributed over its cross section, owing to a non-homogeneous structure of the resistance and consequent non-uniform distribution of the electric load over the cross section, whereby electric puncture may result.

It is an object of the present invention to avoid such non-uniformity in the resistance.

With this and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which:—

Fig. 1 is a side elevation of a resistance system having the invention applied thereto.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 is a side elevation of a modification.

Fig. 4 is a plan view of this modification.

Fig. 5 is an axial section of a further modification.

Fig. 6 is a plan view of Fig. 5.

Fig. 7 is a side elevation of still another modification and

Fig. 8 is a plan view of Fig. 7.

Similar reference numerals denote similar parts in the different views.

According to the invention, the resistance unit is built up of a plurality of individual elements

and the individual resistance elements are accurately measured electrically and mutually adjusted before they are assembled, in order to ensure a uniform loading of all elements, making up together the total cross section of the combined resistance unit.

Referring now to the drawings in greater detail, and first to Figs. 1 and 2, it will be seen that a plurality of rod shaped resistance elements 1 are combined to a bundle of hexagonal cross section, with end plates 2 and 3 effecting the electric connection.

It is also contemplated, within the purview of this invention, that resistance elements of different specific resistance and different voltage characteristics may be combined to attain special effects, such as, a valve effect, which is of special importance where the resistance is to be used for carrying off, or leakage, or arrester purposes. For example, as shown in Figs. 3 and 4, a central, cylindrical resistance element 4 may be surrounded by sector-shaped elements 5 and the central element 4 may have a higher resistance and its resistance may show a greater change with the voltage than that of elements 5, whereby this central element 4 will practically operate only when very high overpressures are occurring which cannot be absorbed by the sector elements 5.

It is also contemplated, moreover, that the resistance elements may be enclosed in an insulating casing of ceramic materials, artificial resin or the like, in which suitable recesses are provided for the resistance elements. A resistance unit of this type is illustrated in Figs. 5 and 6, in which resistance elements 6 are enclosed in a cylindrical cover 7 with end plates 8 and 9, and connected to any suitable terminals (not shown) by means of contact plates 10.

Figs. 7 and 8 illustrate an arrangement in which rod-shaped resistance elements 11 having thickened end collars or contact caps 12 are connected by wires 13 to a terminal 14.

It will be appreciated that my novel type of resistance offers very important advantages over the known types of compound resistances. The load may be increased considerably owing to the full participation of the total cross section of the combined resistance in the conduction of the current. Owing to the augmentation of the total surface of the combined resistance the cooling conditions are substantially improved. The heat developed by frequent loading of the resistance is immediately radiated so that punctures due to high temperature may be avoided.

It will be noted that the increase of the total surface of the resistance is particularly useful where the resistance is to be used for high frequency, in view of the skin effect becoming more and more pronounced with increasing frequency. As is well known, stresses in intervals of 0.001 to 0.02 seconds, with a frequency of  $2 \times 10^4$  cs to  $10^7$  cs, are produced by the discharge of atmospheric disturbances and frequencies of 200 to 1000 cs are produced by interruption of short-circuits. Therefore, my novel composite resistance is very efficient for carrying off flash-over or excess voltages.

Another advantage of my combined resistance resides in the fact that in case of extremely high loads of the kind occurring in the discharge of atmospheric disturbances the puncture is restricted to one resistance element only while the

remaining resistance elements are left unaffected and the resistance unit remains intact.

If desired, the interspaces between the single resistance elements may be filled up by phenol-formaldehyde condensation products of the type known under the registered trade mark "Bakelite" or by gypsum, or by any other suitable solid, liquid or gaseous insulating material, and the adjacent resistance elements may be interconnected in this manner.

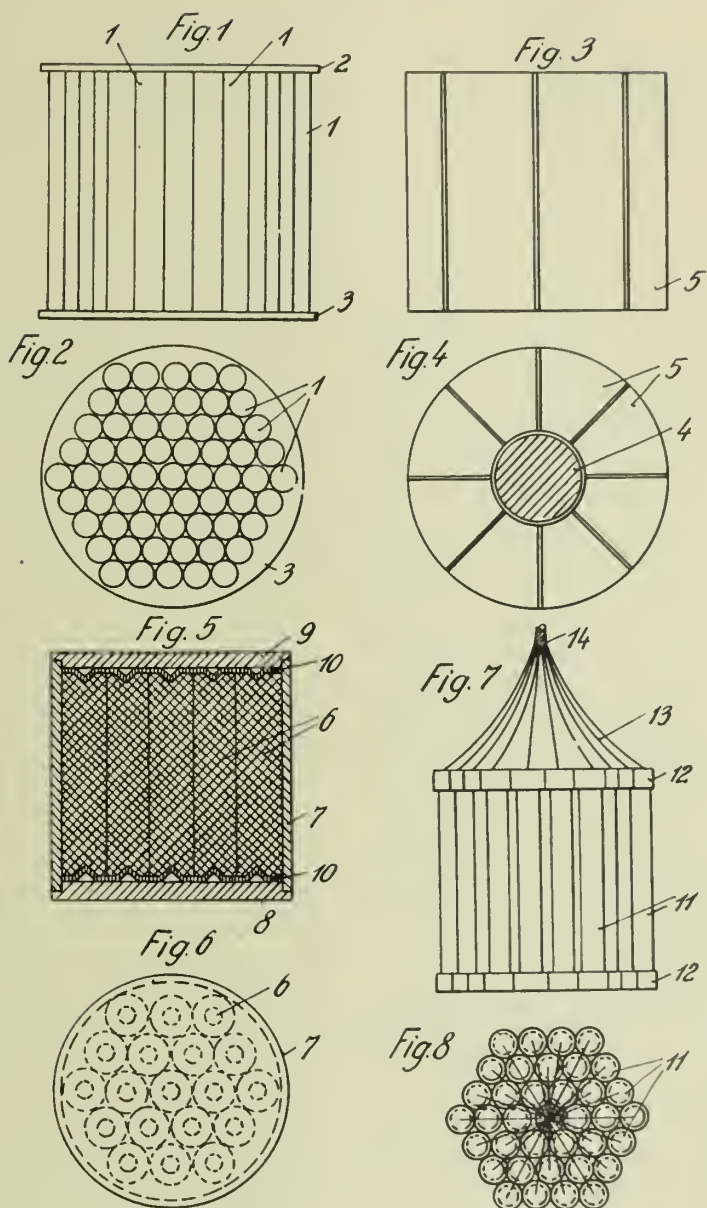
The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

ERNST DOETSCH.

PUBLISHED  
MAY 18, 1943.  
BY A. P. C.

E. DOETSCH  
RESISTANCE SYSTEM  
Filed April 17, 1940

Serial No.  
330,201



Inventor:  
Ernst Doetsch  
By  
Young, Egan & Thompson  
Attorneys



ALIEN PROPERTY CUSTODIAN

CONVEYERS

Heinrich Aumund, Berlin-Zehlendorf, Germany;  
vested in the Alien Property Custodian

Application filed April 17, 1940

This invention relates to a conveyer of the plate or pan type.

The known conveyers of this class, usually fitted with plates having the same length as the links of the plate-supporting endless chain and dumping their load at the end of the working run, are open to the objection that their manufacture is expensive and the load-carrying means are heavy, require much sealing and have a relatively low output.

The invention eliminates these drawbacks by providing a conveying medium in which the load is also discharged over the end of the plates whose length can, however, be increased without regard to that of the chain links to a multiple thereof.

It has been proposed already to use plates which are approximately three times as long as the links of the supporting chain, but in such structures each plate is united with a chain link either at one end over its whole length or at both ends. The extension of the length of the plates beyond the length of a chain link in conveyers of this type can be effected only by letting the other end of the plates freely project. This manner of extending the plates beyond the length of a chain link is, however, limited, since the free projection of the plates beyond a certain distance will render them too heavy and subject the chain to excessive stressing.

For these reasons, the length of plates in such conveyers is restricted to approximately three times the length of a chain link, at the highest.

Compared with the known art, the plates in a conveyer according to the invention can be moved up and down at one end of the working run and are yieldably, for instance longitudinally movably, arranged relative to the chain toward the other end.

Owing to this novel attachment of the plates to the chain, the two fastening points for the

plates on the links can be spaced at will and plate lengths up to twelve times the length of a chain link may be used. This makes it possible for instance to build a conveyer having a plate length of about two meters and an output in excess of 2,000 cbm. per hour.

The invention is illustrated by way of example in the accompanying drawing, in which

Figure 1 is a side view of the load carrying means of a conveyer according to the invention provided with plates being four times as long as the links, and

Fig. 2 is a cross section thereof.

An endless drag or sprocket chain *a* supports plates *b* secured to the chain *a* at *c* which is supported by rollers *e*. *f* designates a sheave for the chain *a* and *g* the rails on which the rollers *e* move which may be attached to the links of the chain *a* or otherwise arranged.

To insure safe guiding of the chain over the sheave *f* in spite of the great length of the plates *b* longitudinal guides *d* are provided at suitable points on the underside of each plate and adapted to cooperate with pins secured to the chain *a*. During movement of the chain *a* over the sheave *f* the pin moves from the front part of the guide *d* to the rear thereof, as indicated in Fig. 1. Instead of providing each plate *b* with a longitudinal guide *d*, the arrangement may be such that the chain links are fitted with oblong holes at suitable points and the guide pin is attached to the plate.

The rollers *e* may be widely spaced without causing sagging of the chain *a* which runs smoothly during operation without any motion in the links.

The invention is of course not restricted to the embodiment shown and described but may be varied as to details without departing from the scope thereof.

HEINRICH AUMUND.



PUBLISHED

MAY 18, 1943.

BY A. P. C.

H. AUMUND

CONVEYERS

Filed April 17, 1940

Serial No.

330,212

Fig. 1

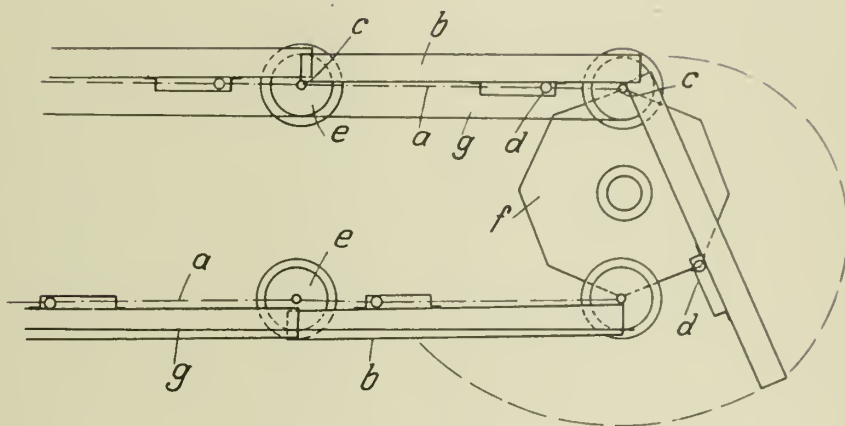
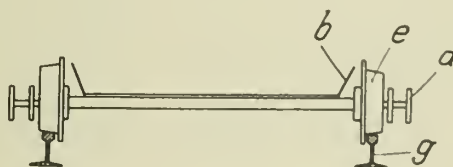


Fig. 2



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# ALIEN PROPERTY CUSTODIAN

## TWO, IN OPPOSITE DIRECTION ROTATING, COMMONLY DRIVEN AIR PROPELLERS

Fritz Nallinger, Stuttgart, Germany; vested in  
the Alien Property Custodian

Application filed April 18, 1940

The invention relates to two, in opposite direction rotating, air propellers commonly driven by more than one motor and consists therein that each separate motor is provided with its own lubricant- and cooling circulation. When a pump is applied for producing the circulation, the same is preferably driven by the corresponding motor and each motor is provided in a suitable manner with a cooling device and a collecting receptacle for the lubricant- or cooling liquid.

The arrangement according to the invention has the advantage that the cooling and lubrication is ensured in the fullest measure. In this manner the cooling and lubricating circulation of the other motors is not influenced when the collecting receptacle or the cooling device of a circuit gets a leak, or when one of the motors stops and it is still rotated by the other working motors, its lubricating- and cooling device still works, as long until the corresponding motor is disengaged and entirely stopped, moreover the stopped motor does not influence the cooling and the lubrication of the other motors.

The motors are advantageously provided with a common crank casing containing the cranks of the separate groups of cylinders and upon which the cylinders belonging to each crankshaft may be mounted, again in a V, according to the rotating direction making an angle the one with the other. The gear for the commonly driving mechanism of the opposite rotating air propellers or the intermediate gears are also provided with a separate lubricating liquid circuit. Further the pumps for producing the lubricating circuits for the gear mechanisms are dependently driven by the commonly driven air propeller shafts. The driving of the opposite rotating air propellers takes place in such a manner, that all the motors actuate both air propeller shafts so that, when one motor cuts out the driving of both air propellers in opposite direction with respect to each other is still maintained. Common crank casings for all the motors have the advantage of a compact construction of all the motors and driving parts and a simple fixing of all the parts of the aircraft.

The drawing shows a form of execution according to the invention and the figure shows these two motors with a common crank casing

and in opposite direction rotating air propellers.

The motors 1 and 2 are mounted upon a common crank case 23 and drive each through a disengageable free-wheel coupling 3, 4 the tooth gears 5 and 6, the tooth wheel 7 and the propeller shaft 8. On the same shaft as the tooth wheels 5 and 6 are fixed tooth wheels 24 and 25 for each motor engaging intermediate gear wheels 26 and 27. These intermediate gear wheels 26, 27 engage a gear wheel 23 and drive the second propeller shaft 29 executed as a hollow shaft. When a motor cuts out the driving of both air propeller shafts is maintained.

According to the invention, to each motor belongs a lubricating oil pump 9 sucking e. g. oil from a collecting receptacle 10 and supplying this oil to the lubricating spots 11 of the cylinders resp. 12 of the crank shaft. The return pipe or back flow 13 passes a cooling device 14. Moreover a filter 15 is placed at a suitable spot in the oil circuit. Each motor drives further a cooling water pump 16. This pump gets its water from a collecting receptacle 17 and supplies the same to the spots to be cooled of the motor e. g. to the cylinder jacket 1, 2. The back flow 18 of the cooling liquid passes a cooling device 19.

The gear mechanism 5, 6, 7, 24, 25, 26, 27, 28 has also a separate lubricating circuit produced by a pump 20, which circuit also contains a cooler 21 cooled by the driving wind. The pump 20 is suitably driven in dependence of one of the commonly driven propeller shaft 8 e. g. by means of a transmission gear 22.

The working of the shown arrangement follows without more from the drawing. It is within the scope of the invention unessential how the motors are constructed, in what manner and by what fuel the motors are driven, how many motors the shaft 8 drives and where the cooling devices are placed. The cooling devices and receptacles of each circuit may be divided in order to house the same with respect to the available space and safety as well as possible. It is also possible to make the parts disengageable, and when necessary the liquid cooling may be replaced by a ventilator air cooling. It is evident that the arrangement may be so executed that the driving motors have separated crank casings.

FRITZ NALLINGER.



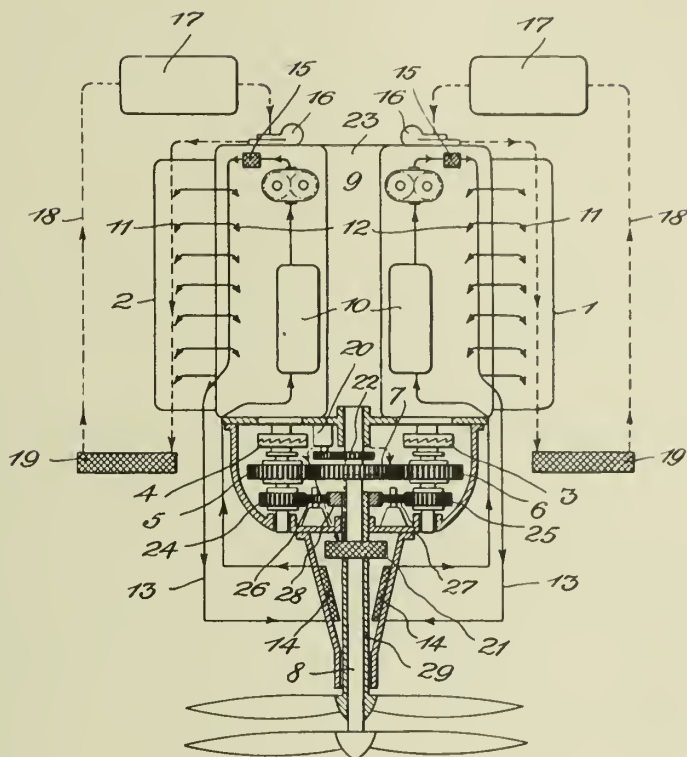
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MAY 18, 1943.

BY A. P. C.

F. NALLINGER  
TWO, IN OPPOSITE DIRECTION ROTATING,  
COMMONLY DRIVEN AIR PROPELLERS  
Filed April 18, 1940

Serial No.  
330,322



Fritz Nallinger

INVENTOR

BY

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# ALIEN PROPERTY CUSTODIAN

## BOXES FOR ELECTRIC APPARATUS

Willy Niedermeyer, Berlin, Germany; vested in  
the Alien Property Custodian

Application filed April 19, 1940

The present invention relates to boxes or housings for electric apparatus, especially apparatus employed in the communication art, such as chopped anode current devices, for instance, and it has for its object so to improve these boxes that the electric parts of such apparatus shall be easy to mount therein and also easy to wire.

The invention consists in certain features of novelty which will appear from the following description and be particularly pointed out in the appended claims, reference being had to the accompanying drawing, in which

Fig. 1 is a perspective view showing one embodiment of the invention with a cover plate removed, Fig. 2 represents a section on line 2—2 of Fig. 1 with this cover plate secured in position, Fig. 3 is a fragmentary view illustrating another embodiment of the invention, while Fig. 4 is a fragmentary view of still another form thereof.

The box shown in Fig. 1 comprises a casing 1 which may be made of a cast light metal and is subdivided by partitions 3 into chambers 2 so as to resemble a honeycomb structure or house of cards. A cover plate 10 for these chambers can be fastened to the casing by means of screws 5, as shown in Fig. 2. To such end partitions 3 and the walls of casing 1 have enlargements 6 provided with threaded holes for the screws 5. The cover plate 10 when held in position by these screws is in close contact with the end faces of the partitions 3 in order to effect an electric and magnetic screening for each chamber.

Cover plate 10 has a flange 7 overlapping the outer wall of the casing 1.

The partitions and walls of casing 1 may be formed with guide bars or brackets 8 to support devices which constitute an electric assembly, such as transformers, coils or the like.

As shown in Fig. 2, instead of a cover plate common to all of the chambers 2 each chamber may have a separate lid 9, whereby access may be had to it without uncovering the other chambers.

Equally, lids may be provided which are each common to a group of chambers.

Such cover plates or lids, instead of fixing them by screws or other fastening means of this kind, may be secured to the casing 1 by welding or riveting.

While in Fig. 1 the partitions 3 are formed integral with the casing 1 by casting, for instance, they may be of sheet metal fixed to the casing and to each other by riveting or welding. An example of such a construction is shown in Fig. 3. Some of the partitions have tubular bends 4 which are threaded in order to receive fastening screws, such as the screws 5 represented in Fig. 2.

Fig. 4 shows partitions 3' which are each composed of two sheet metal plates welded or riveted together and bent at opposite points to form holes 4'. These are threaded in the same manner as the bends 4 shown in Fig. 3.

WILLY NIEDERMEYER.



PUBLISHED

MAY 18, 1943.

BY A. P. C.

W. NIEDERMEYER

BOXES FOR ELECTRIC APPARATUS

Filed April 19, 1940

Serial No.

330,523

3 Sheets-Sheet 1

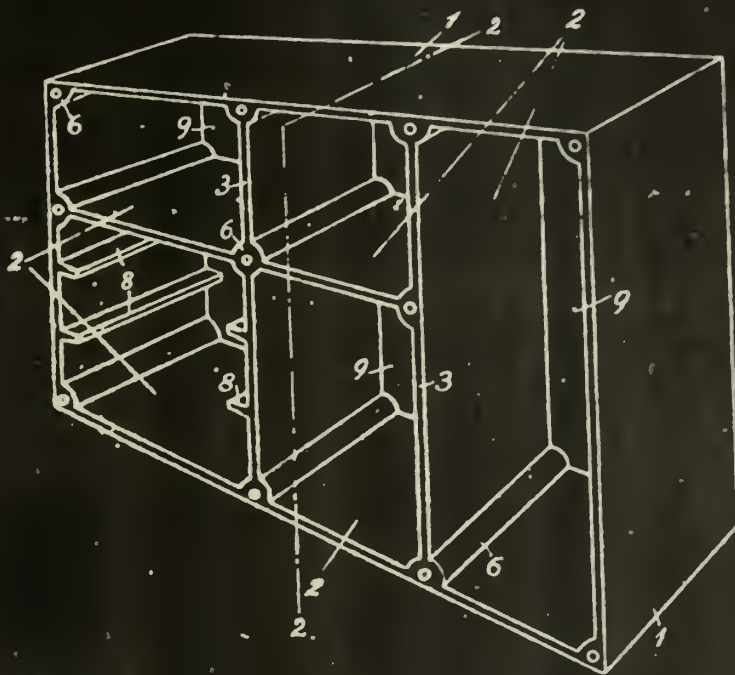


FIG. 1

W. Niedermeier

by

att'y

INVENTOR

BY *R. C. Foxgood*  
ATTORNEY



PUBLISHED

MAY 18, 1943.

BY A. P. C.

W. NIEDERMEYER

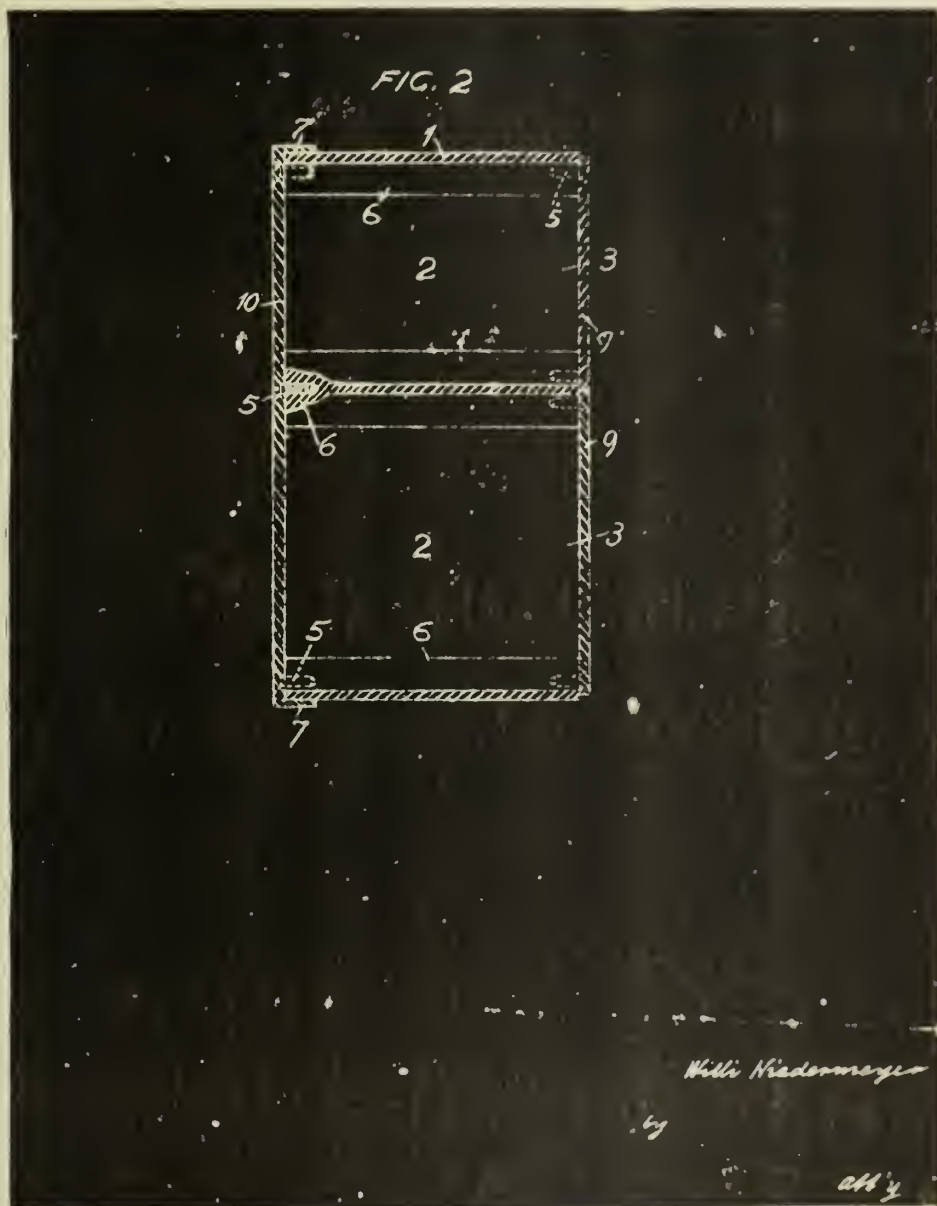
BOXES FOR ELECTRIC APPARATUS

Filed April 19, 1940

Serial No.

330,523

3 Sheets-Sheet 2



INVENTOR

BY

*R. C. Hargood*

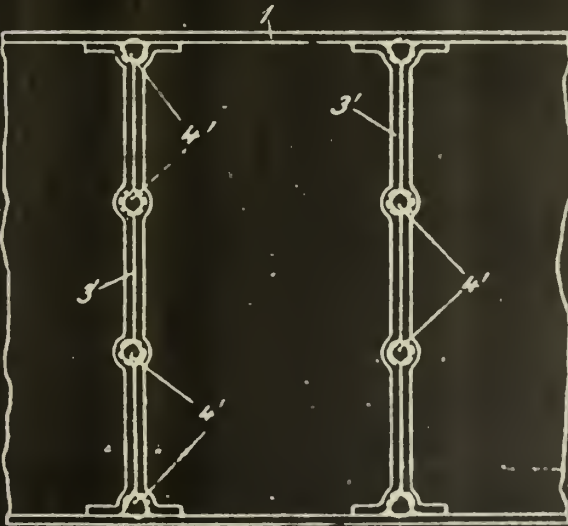
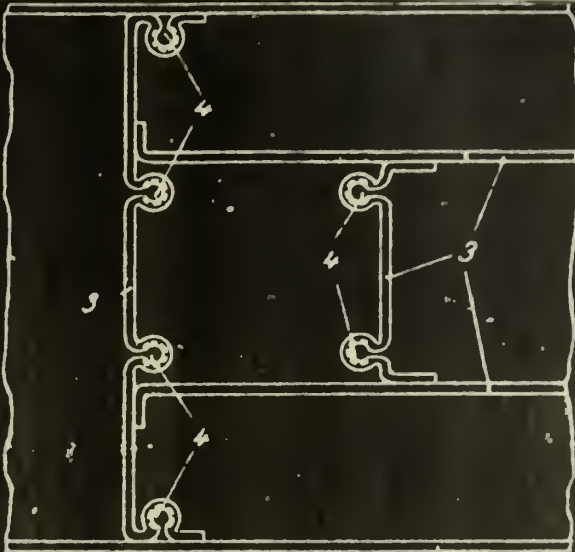
ATTORNEY



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W. NIEDERMEYER  
BOXES FOR ELECTRIC APPARATUS  
Filed April 19, 1940

Serial No.  
330,523  
3 Sheets-Sheet 3



W. Niedermeier

by

att'y

97 940 III D. 1940: G. 43a.0)

INVENTOR

BY *R. H. Hopgood*  
ATTORNEY



# ALIEN PROPERTY CUSTODIAN

## TREATMENT OF HYDROCARBONS

Paul Woog, Paris, France; vested in the Alien  
Property Custodian

No Drawing. Application filed April 19, 1940

The object of the present invention is an improvement in the treatment of hydrocarbons in order to increase their anti-knock properties, by subjecting them to a catalytic cracking in the presence of sulphur derivatives.

The reaction on which the process is based is the transformation of organic combinations of sulphur by heat, in the zone of 300 to 500° C., in the presence of suitable catalysts and in contact with the fuel to be treated.

The catalyst used may be cadmium, molybdenum, tungsten sulphide, natural or activated clayey earths, alumina, magnesia, quick-lime, silica gel, pumice-stone, kieselguhr, active charcoal, alkaline-earth silicates or mixtures of these substances.

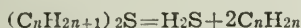
The sulphuretted molecules required for the foregoing reactions (neutral sulphides, mercaptans, etc. etc.) may be molecules that exist naturally in the products to be treated; use may also be made of artificially prepared sulphuretted molecules or of molecules that exist naturally in some sulphuretted products which are not fuels (oils of sulphurized schists, residues of washing or refining processes, suitable fractions of sulphurized petroleum, etc.). Fuels which are naturally sulphurized may therefore be enriched in organic sulphur in order to make them capable of being subjected to a more efficient treatment; on the other hand, unsulphurized fuels may also be treated after the addition of suitable quantities of sulphuretted products.

The elimination of the sulphur, which is effected in the form of sulphuretted hydrogen should lead to the appearance of free valences which are capable of reacting and of uniting with other molecules which are substituted for the sulphur.

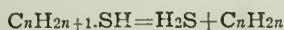
By way of example, the reaction may be written:



and



or again



In these equations, it is the member  $C_nH_{2n}$  which is capable of uniting with other molecules, thereby converting the aliphatic, aromatic or cyclic hydrocarbons into branched or substituted hydrocarbons.

It is known that branched hydrocarbons generally possess more marked anti-knock properties than unbranched hydrocarbons.

the branching phenomena, the sulphuretted organic molecules produce, owing to the elimination of the sulphur, hydrocarbons which per se improve the average anti-knock properties of the fuel.

The treatment for carrying out the present process may be effected in the vapor phase or in the liquid phase, at atmospheric pressure or under pressure.

It is not outside the scope of the invention to apply the process with the known catalytic cracking apparatus and with the improvements made in catalytic cracking during the last few years.

*Example I.*—The product to be treated may be obtained for example from a crude Irak petroleum which is rich in sulphuretted organic combinations or, on the contrary, from a crude Texas petroleum to which 5 to 6% of sulphurized schist oils have been added.

The product, which has been completely vaporized in a suitable furnace, is introduced at atmospheric pressure into a second furnace filled with catalyst.

This catalyst is raised to a temperature between 350° and 450° C. but which is so regulated as to obtain the best reaction while producing the minimum quantity of gas. With a suitable adjustment, said gas can be limited to the sulphuretted hydrogen produced by the reaction and the losses are therefore reduced to a minimum. In certain cases, it is advantageous to supply to the catalysis furnace a certain quantity of steam at the same time as the fuel vapors. As they issue from the catalysis furnace, the vapors are condensed, the fuel is optionally separated from the water, then washed with soda in order to remove the dissolved sulphuretted hydrogen. A treatment with plumbite of soda, for example, is not necessary.

It has been observed that during the operation of the catalysts the same have a tendency to become covered with a more or less substantial carbon deposit which decreases the efficiency. This deposit therefore impairs the reactions and, after some time, the catalysts have to be changed or regenerated. This regeneration may be effected by passing a current of air or steam over the worn out catalysts, care being taken to raise the temperature sufficiently to enable the reactions that destroy the carbon coating to take place.

*Example II.*—The fuel to be treated, which has previously been enriched in sulphuretted organic combinations, is heated in a closed vessel; the pressure which is set up in the vessel is obviously

proportional to the temperature obtained. The operation may be discontinuous or continuous, the product circulating in the latter case under the effect of suitably arranged pumps. In any case, the product which has been raised to the reaction temperature is placed in the presence of similar catalysts to those referred to above.

When it issues from the reaction chamber, the

fuel is washed with soda in order to remove the dissolved sulphuretted hydrogen.

The products obtained by means of the treatment which is the object of the present invention contain practically no sulphur. They show considerably improved anti-knock properties and a very satisfactory susceptibility to tetraethyl lead.

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# ALIEN PROPERTY CUSTODIAN

## SIGNALLING OR ADVERTISING DEVICES

Armand Zuckermann, Paris, France; vested in  
the Alien Property Custodian

Application filed April 24, 1940

Signalling or advertising devices are already known which are constituted by boards of juxtaposed elements capable of changing their aspect under the action of an external manual or automatic control device. These elements are, for instance, lamps which light or go out, or reflecting surfaces visible in a certain so-called working position and invisible in another so-called rest position, either by the displacement of said surfaces, or by the displacement of a shield which covers them, or on the contrary, uncovers them, according to its position. The device controlling said elements comprises switching means which allow some of said elements to be given, simultaneously or successively, their working aspect, for forming certain figures, and to maintain said aspect until a reverse manipulation is effected which restores to them their rest aspect.

For solving this problem, use has been made, up to now, for each element, of a relay which will be called herein energising relay, because it is its energisation which causes, directly or indirectly, the corresponding element to assume its working aspect. Two cases must then be considered, according as the element is devised to automatically assume its rest aspect as soon as the energisation ceases, or as it maintains its working aspect after the energisation has ceased. In the first case, a holding circuit must obviously be provided for each relay, the return to rest aspect taking place by simply cutting off said holding circuit; in the second case, a special device must be provided, for instance an electric, mechanical or pneumatic device which restores their rest aspect, at the required moment to the elements which have maintained their working aspect.

Owing to the lack of ruggedness of the energising relays used up to now, it had always been considered as impossible to place said relays in the immediate vicinity of the optical elements, and for instance on the rear or dorsal face of the board supporting them. The considerable advantage that would be obtained in placing the energising relays in the immediate vicinity of the elements had indeed been admitted, but objection was raised against the necessity of sheltering said relays for protecting them to the maximum from the external influences which would be prejudicial thereto, and against the necessity, none the less imperative, of then protecting each circuit of the elements by a fuse-wire, since the length of wire between the contact of the relay and the element would be very

short and would no longer constitute a protecting resistance. It was set forth that the expense of a fuse-wire for each element would compensate the advantages which might be obtained in arranging the relays in the immediate vicinity of the elements.

The invention is adapted to satisfy the double condition of placing the relays in the immediate vicinity of the elements and of eliminating the necessity of using protecting fuse-wires.

For that purpose, it is characterised by the novel application to signalling or advertising apparatus of the type described, of relays having an expansible conducting wire, this novel application being moreover distinguished by the fact that said expansible conducting wire is common to the circuit of the element and to an energising circuit, so as to be heated by the temporary closing of said energising circuit and to be kept heated by the closing of the main circuit, determined by its lengthening.

It will be understood that such relays, very rugged and unable of getting out of order by the variations of external temperature provided that the support for the wire is made of a material having a coefficient of linear expansion approximating that of the wire, can without objection, be placed at the back of the board or panel supporting the elements; and that, moreover, the expansible wire, which is located in the circuit of the element, constitutes in itself a protection for the circuit in the same manner as a fuse-wire.

The accompanying drawing illustrates, by way of example only, some forms of carrying out the invention.

Fig. 1 is a diagram of a first method of wiring; in this diagram, the relay having an expansible conducting wire is illustrated in a simplified form, but it is to be understood that, in said Fig. 1 as well as Figs. 2 and 3, mentioned hereinafter, it is intended to indicate a relay according to the embodiment illustrated in detail in Figs. 5 and 6 indicated hereinafter.

Fig. 2 is a diagram of a second method of wiring.

Fig. 3 is a diagram of a third method of wiring.

Fig. 4 is a general diagram.

Fig. 5 shows a sectional elevation of the preferred form of relay.

Fig. 6 is a plan view thereof.

Fig. 7 is an elevation of the method of mounting the relay on the board.

Fig. 8 is a detail view in elevation.

Fig. 9 shows a sectional elevation of another embodiment.

Fig. 10 is a plan view thereof.

Fig. 11 is a wiring diagram.

Fig. 12 shows another wiring diagram.

Fig. 13 is a still another diagram.

For effecting the initial energisation, that is to say, to raise the temperature of the wire:

(a) As in the example of Fig. 1, use can be made of a special energising circuit having a particular source of electric energy. In this figure, the movable contact 1 is carried at the end of a resilient blade 2 held at 3 and connected at this place to one of the points 4 where the expandible conducting wire 5 is attached. Said expandible wire 5 is stretched between the point 4 and the point 6, substantially parallel to the resilient blade 2 which presses by means of the insulating push-piece 7 near the middle of the wire 5, so that the movable contact 1 cannot, at ordinary temperature, touch the fixed contact 8. The point 6 is connected by the wire 9 to the lamp 10 (or any other optical element as explained), connected by the wire 11 to the switch 12, then by the wire 13 to a first source of current 14, connected, in its turn, by the wire 15, to the fixed contact 8. Finally, another source of current 16, which is to effect the energisation, is connected, on the one hand, through the medium of the switch 17, to the end 4 of the wire 5 and, on the other hand, to the end 6 of said wire.

In the position illustrated, all the circuits are open. For causing the device to operate, the contact 12 is first closed, which at this moment has no effect, since closed contact 12 is in series with contacts 1 and 8 which do not touch each other. But if contact 17 is closed for an instant, the expandible wire 5 is fed by the source of current 16 and rapidly heats up. Wire 5 lengthens, so that the spring 2 can expand upwardly and that the contacts 1 and 8 can touch each other. It will be noted, as an important point, that their contact pressure is determined solely by the strength of the spring, as soon as the wire 5 has lengthened sufficiently.

The utilisation circuit is then closed and the current of said circuit passes through wire 5 which is maintained at a high temperature. Consequently said circuit remains closed until it is intentionally opened, by actuating the switch 12. At this moment, of course, wire 5 is no longer fed with current. It cools, stretches again, compels the spring 2 to deflect downwardly and thereby cuts off the contact 1-8. Further closing of contact 12 will no longer produce any effect, it will be necessary to act on contact 17 in order for the operation just described to take place again.

(b) Also, as in the example of Fig. 2, contacts 1-8 normally open can be short-circuited for producing the energisation, and consequently a single source of electric current 16 need be used. In this case, it suffices to connect the wire 9 of Fig. 1, not to point 6, but to the pole 18 of the source of current 16, and to dispense with the source of current 14. The diagram of Fig. 2 is then obtained, in which it will easily be seen that by temporarily closing the switch 17, wire 5 is placed in circuit (provided that switch 12 has been previously closed). Said wire heats up and closes the contacts 1-8, thereby closing the circuit of the lamp 10, said circuit remaining closed until the contact 12 is temporarily opened.

It is to be mentioned that contact 12 is only one means, among others, for cutting off the cir-

cuit of utilisation. Other means can be used for that purpose, which all consist in determining in any manner whatever, the cooling of wire 5. For instance, this cooling can be obtained by short-circuiting said wire (Fig. 3). In this example, the fixed contact 17<sup>a</sup> is connected by the wire 19 to a switch 20 having a fixed contact 21 connected to the pole 18 of the source of current 16, and another fixed contact 22 connected to the second pole 23.

When the switch 20 is in the position illustrated, in which it touches the contact 21, the diagram of Fig. 2 is obtained and, consequently, the temporary closing of contact 17 determines the energization of wire 5 and the closing of the circuit of the optical element, as explained. But, when, on the contrary, the switch 20 touches the contact 22, the temporary closing of contact 17 has the effect of short-circuiting wire 5; therefore, when said contact 17 is closed, wire 5 is no longer fed with current, as the difference of potential between points 23 and 4 becomes practically null; wire 5 therefore cools and contacts 1 and 8 separate.

In this arrangement it will be noted that the element 10 is slightly boosted when the switch 20 being in contact with 22, contact 17 is temporarily closed. This particularity can, in certain applications, be considered as an advantage; for instance, if the element 10 is a lamp, said lamp shines with a brighter light before it goes out, and it may be that, for advertising or signalling purposes, advantage may be taken of this property. Moreover, it will be noted that if the period during which contact 17 is closed is very short, it will not produce the opening of contacts 1-8, as wire 5 will not have time to cool; thus, by means of contact 17 can be obtained, either the energization of 10 when contacts 20-21 are closed, or, when contacts 20-22 are closed, the temporary boosting of 10 followed or not by its de-energization. This property can in certain cases be of very great interest.

In all the embodiments described, it can clearly be seen:

That the use of heat, during energization is excellent; the energy consumed is in fact entirely used in the wire;

That the temperature reaches such a high degree (for instance 300 to 350°) that the operation is entirely independent of the variations of the external temperature;

That the cooling is rapid, for the very reason of the relatively high temperatures of operation, and owing to the fact that the wire is in the best conditions for cooling;

That wire 5 offers the great advantage of also constituting fuse-wire protecting the element such as 10.

Having described the relay according to the invention, some methods of application thereof will now be set forth. In the example of Fig. 4, a board 34 is provided with lamps juxtaposed in vertical and horizontal rows; some of said lamps only are diagrammatically illustrated for instance at 10 and 75. The connections of lamp 10 will simply be described, for instance, as they are the same for the other lamps. The terminal 35 of lamp 10 is connected by a wire 38 to point 8 of a relay according to preceding Figure 3, and point 6 is connected by the switch 12 to the pole 23 of the source 16 of electric energy, the second pole 18 of which is connected by a wire 26 to the second terminal 37 of the lamp 25. The wires 36<sup>a</sup> and 36 are respectively multiplied, as diagrammatically

illustrated by the arrows 39 and 40, on all the other lamps of the board.

The point 4 of the relays 36 respectively associated with the lamps such as 75 of one and the same first vertical row A are connected by wires such as 76 to the first active contact-pieces 77 of a series of contact banks 78 each comprising as many contacts as there are lamps in one and the same horizontal row. There are as many contact banks 78 as there are lamps in one and the same vertical row.

Thus, a lamp of the vertical row in line *p* and of the horizontal row in line *q* has its auxiliary electrode connected to the contact in line *q* in the contact bank for line *p*.

The wipers 79 corresponding to each contact bank are independently connected by wires such as 80 to brushes 81 placed above a perforated band 82 mounted for instance on rollers 83. The brushes 81 are arranged transversely to said band above a conducting table 84, connected by the wire 85 to the suitable terminal of the source of energy 16. Finally, the wipers 79 are all driven simultaneously and in synchronism with the perforated band 82, in such a manner that a hole of the band can present itself under a brush 81 only when the wipers such as 79 touch the contacts of a definite line, in each of the contact banks. The movement of the wipers 79 and of the band 82 can be continuous or discontinuous and of uniform or variable speed.

Each wiper 81 and 79 thus controls the lamps of one and the same vertical row; if it is assumed that there are *x* lamps in a vertical row, there will therefore be *x* wipers 81—79; and if there are *y* lamps in a horizontal row, each contact bank 78 scanned by a wiper such as 79 comprises *y* contacts.

The operation is as follows: when the wipers 79 are on the contacts No. 1, the lamps of the vertical row No. 1 are subjected to the control of the perforated band 82. Some of the wipers 81, passing through the perforations, are, at this moment, in contact with the table 84. Consequently, the lamps of the first vertical row corresponding to said holes of the perforated band, light. Then, the wipers 79 as well as the perforated band 82 move one step forward.

The wipers 79 then touch the contacts corresponding to the second vertical row of lamps, which are then controlled by the perforated band 82. The operation is repeated up to the last vertical row of lamps. At this moment, the movement of the wipers 79 and of the band 82 is stopped for a time; then the contact 12 is opened for detemining, automatically or not, the extinguishing of the lamps. Finally, the device starts again in the same manner as previously. Or else the switch 20 can be moved on to the contact-piece 22 and ensure the extinguishing, lamp after lamp, according to all possible combinations.

The coordination of the synchronous movements of the perforated band 82 and wipers 79 can be obtained by any known means, and in particular by a simple kinematic connection between the shafts of 82 and of 79.

Figs. 5 and 6 illustrate a practical form of construction of the relay. In this example, the point 6 of attachment of the expansible wire 5 is provided on a cut-out member 105, the shape of which will be more fully described later on; and the point 4 is provided on the member 106 which is substantially flat, except as regards the bent down lug which constitutes the point of attach-

ment 4 and two flanges 107 and 108 also bent down which ensure the rigidity of the whole. The member 106 terminates in a plug 106<sup>a</sup>. Finally the point 2 is provided on a third cut-out member 109.

The members 105, 106 and 109 are superposed with the interposition of insulating washers, and mechanically connected by an eye 110; but they are electrically insulated. The members 105 and 109 are slightly bent back so that their ends 105<sup>a</sup> and 109<sup>a</sup>, in the form of plugs, are in the same plane as the plug 106<sup>a</sup>.

Finally, the resilient blade 2 is secured at 3 on the member 106, which is perforated at 111 for the passage of the disc 112, made of insulating material which is interposed between the wire 5 and the resilient blade 2.

Fig. 6 is completed by a wiring diagram quite identical to that of Fig. 2, which renders unnecessary any complementary description of this embodiment.

Figs. 7 and 8 then show the manner in which the board of lamps is fitted up. This board comprises a conducting plate 98 in which the lamps 10 are screwed, the base of the lamps pressing against spring blades 95. Said blades 95 are secured on thimbles 113, mounted in their turn on insulating cross members 114, also receiving other thimbles 114<sup>a</sup> and 115. The thimbles 115 correspond to the plugs 105<sup>a</sup>, thimbles 114<sup>a</sup> to plugs 106<sup>a</sup> and thimbles 113 to plugs 109<sup>a</sup>, as clearly shown in Fig. 6. It is therefore a very simple matter to replace or exchange a relay such as that illustrated in Figs. 5 and 6, since it suffices to remove a member having three plugs and replace it by another, without having to effect any connection, just as if it was a wall-plug or a fuse.

In all the foregoing embodiments, the relay according to the invention was used in combination with lamps; but it can also be utilised in combination with electromagnets for actuating and changing from rest aspect to working aspect, and vice versa, an optical element which is not a lamp, but a surface, which, in a certain so-called working aspect, reflects, refracts or diffuses luminous rays arising from any source whatever illuminating the board, whereas in another so-called rest aspect, it is, for instance, invisible. It is to be understood that this definition includes not only surfaces which pass from one aspect to the other by changing their position, but also those which pass from one aspect to the other, by the displacement of an auxiliary member such as a movable shield with, for instance, illumination behind the board.

In the example of Figs. 9 and 10 the relay is combined with an electromagnet 115 the movable armature 117 of which is kinematically connected to a lever 118 through the medium of a flexible strap 119, for instance of leather or rubber. The lever 118 is pivoted at 120 and it carries a circular guide 120' for the strap 119; the latter, in fact, winds on the guide 120' the axis of which coincides with that of the pivot 120. The lever 118 might also be supported by a flexible blade made of spring steel, which would allow it to move angularly without having recourse to a pivot.

The lever 118 carries a spherical shield 121 which, in rest position, screens a mirror 122 adjustable in position which constitutes the optical element, reflecting, when it is uncovered the light towards the observer's eye. The shield 121 is provided with inclined fins 123 constituting a

dark background avoiding any interfering reflections, in such a manner that the board, when all the shutters 121 are in their position of rest, appears entirely black. It will be understood that when the electromagnet 116 is suitably energised, the armature 117 is attracted and the shutter 118 moves angularly and upwardly uncovering the mirror 122. The latter, illuminated by daylight or artificial light, then appears brilliant against the black background.

In an arrangement of this kind, and in the case in which the current supplied is alternating current, it is possible to effect, for controlling the shutter 121, two operations with a single contact. One of these operations consists in energising the relay having an expansible wire without however actuating the shutter; this operation will be called recording. During the second operation the actuation of the shutter is produced.

This possibility offers great advantage; it allows, for instance, of preparing a drawing, or a part of the drawing, for causing it to appear or to disappear at a single stroke and as many times as desired, allowing to obtain a twinkling or flickering which attracts more the attention of the public. For that purpose, the relay is devised in such a manner that it can be energised by a relatively low voltage, for instance 8 volts, and the electromagnet 116 is so constructed that it cannot be sufficiently energised by said voltage. Consequently, when the 8 volt tension is applied, the expansible wire 5 lengthens, determines the closing of contacts 1 and 3, thereby causing low voltage current to pass into the electromagnet 116 which is not energised, and maintains the relay energised. When the 12 volt tension is then applied, the electromagnet 116 is fully energised, attracts the armature 117 and, by means of the strap 119 causes the lever 118 to pivot. The shutter or shield 121 then uncovers the mirror 122 which appears.

It is to be noted that the 12 volt tension determines at the beginning in the expansible wire an intensity sufficiently high for it to become dangerous if it lasted, but in proportion as the core 117 penetrates into the winding 116, the self of the coil increases, which has the effect of reducing the intensity to a value just sufficient for maintaining the relay energised and of reducing the consumption by the diminution of the intensity and the increase of the phase displacement.

If the 4 volt over-voltage is eliminated, the electromagnet 116 ceases to be sufficiently energised and the shutter 121 falls back; by re-establishing said over-voltage, the operation described starts again. It is therefore possible to obtain the twinkling of the apparatus in this manner.

Fig. 11 diagrammatically illustrates an arrangement of this kind. In this diagram, the expansible wire is shown at 5, and the contacts 1 and 3 are separated therefrom, but it is to be understood that the wiring is the same as previously. The circuit of utilisation is fed by the secondary 124 of a voltage reducing transformer, the primary 125 of which is fed by the source of energy 126 through a switch 127 so devised as to connect the terminal 123 to one of the two terminals 129 or 130. It is then obvious that according to the position of 127 the circuit of utilisation is fed under high voltage (when 123 is connected to 130) or under low voltage (when 123 is connected to 129). In this latter case, the closing of contact 17 suffices to energise the wire 5,

but not the electromagnet 116 after the closing of contacts 1 and 3; consequently, the recording is obtained in this position. If the switch 127 is then caused to rotate, 123 and 130 are connected which determines the energisation of the electromagnet 116. By returning to the first position, the feeding of the utilisation circuit is stopped during a short moment, so that 116 de-energises, but not the wire 5, the deenergization of which would require an interruption of longer duration. Then the circuit of utilisation is again fed with low voltage current, which maintains the recording and so on. The twinkling of the apparatus is thus obtained.

The example of Fig. 12 relates to the case in which the signalling elements are lamps 10; in this case the preceding diagram cannot be applied, as even with a voltage much lower than normal voltage, the lamps would still be visible. Contacts 1-3 are then replaced by two series of contacts 1<sup>a</sup>-3<sup>a</sup> and 1<sup>b</sup>-3<sup>b</sup>. Contact 3<sup>a</sup> is connected to the contact 131 of a switch 133 and contact 3<sup>b</sup> is connected through lamp 10 to the contact 132 of said switch 133.

The arm 134 is connected to the point 125 of the feeding secondary 136, whereas the arm 137 is connected to the point 133 of said secondary. In the position illustrated, the circuit is therefore fed with low voltage current for recording, when contact 17 closes, but the circuit of lamp 10 is open. In the reverse position, the circuit of wire 5 is fed with high voltage current, said wire 5 being then in series with lamp 10. Once the recording is effected in the position illustrated, the twinkling is produced by the periodic actuation of the switch 133.

In the example of Fig. 4, the use of a rotary distributor 79 has been described which allows of obtaining a drawing by the successive scanning of the vertical or horizontal lines; but, on the same apparatus, a second distributor 79' can be provided which, whereas the first distributor 79 scans the drawing through vertical lines, allows the drawing to be scanned through horizontal lines. One or the other of said distributors is set in action, each of which having a position of rest in which the wipers 79 or 79' are in contact with dead contact-pieces. While one of them operates the other is at rest. The wires such as 76 are then suitably multiplied, as shown in Fig. 4.

Such an arrangement has the double advantage of avoiding monotony and of facilitating the tracing of the lines of any directions.

It would also be interesting to be able to cause to successively appear on the board, drawings corresponding, for instance to the successive phases of a movement, in order to obtain a rudimentary motion picture.

Fig. 13 shows a diagrammatic example of this kind of assemblage in which the elements are distributed in two series, one of said series comprising for instance the rows of elements of an even number line (which are not necessarily rectilinear rows, but which can have any desired shape) the other series comprising the rows of odd number lines.

The switch 127 is the same as that of Fig. 11 and serves, for the entire board, for supplying current of high or low voltage, as already described. If it is stopped in the position in which all the circuits are cut off, use can then be made in lieu thereof, of the switch 140 (which also comprises a position in which all the circuits are cut off). This switch allows of alternately feed-

ing with high voltage and low voltage current one and the other of the series of elements and of thereby obtaining two phases of a motion picture. A larger number thereof might obviously be obtained. The switch 140 being held stationary in its position of rest, the operation can be resumed by means of the switch 127.

It is to be noted that as many switches 140 as desired can be provided, each of said switches corresponding to a definite part of the board. It must also be noted that the rows controlled by the various switches 140 can have different colours.

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Fig. 1.

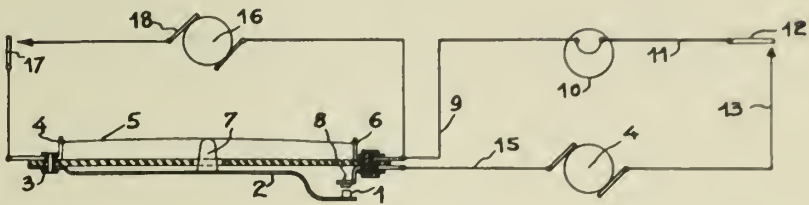


Fig. 2.

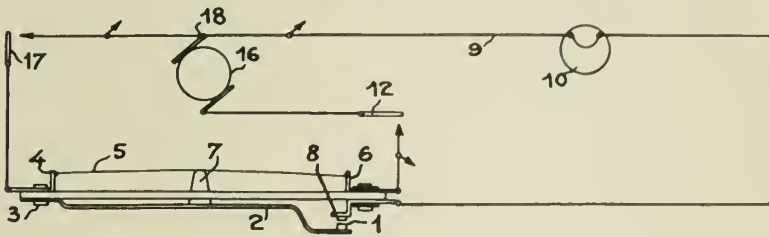


Fig. 3.

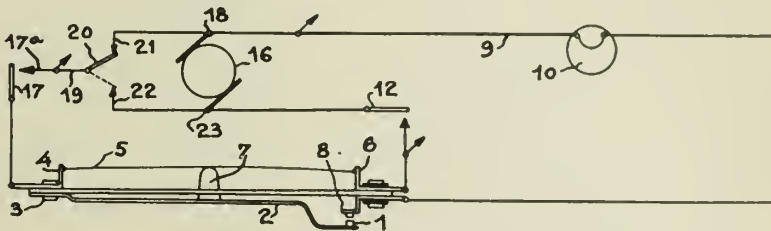


Fig. 5.

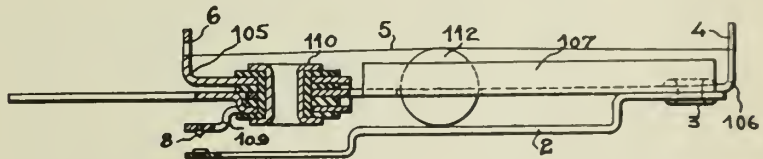
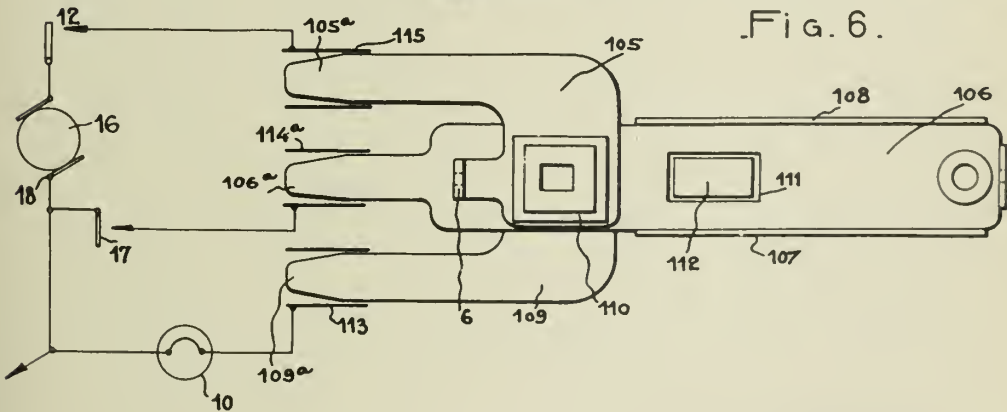


Fig. 6.



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PUBLISHED

MAY 18, 1943.

BY A. P. C.

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SIGNALLING OR ADVERTISING DEVICES

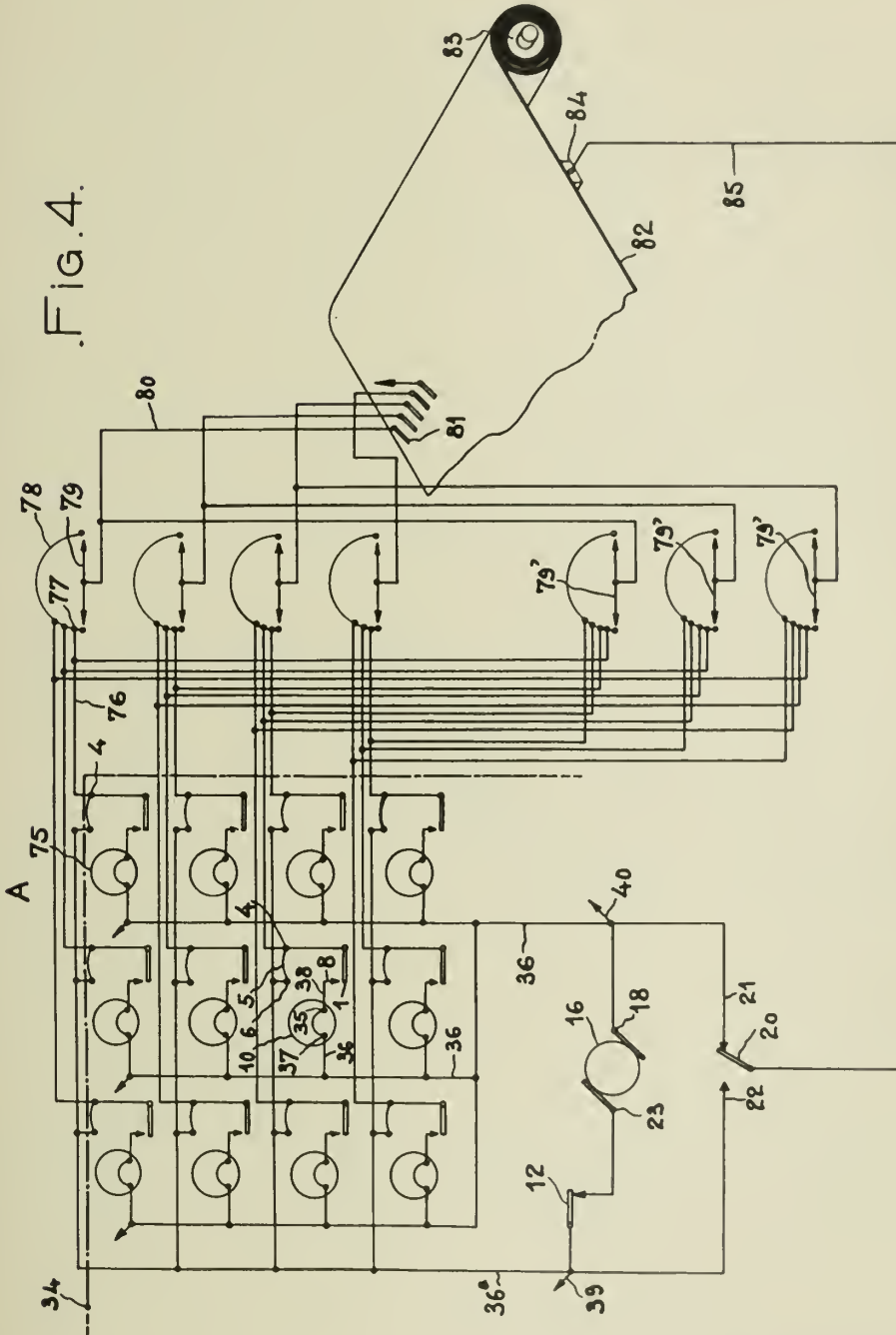
Filed April 24, 1940

Serial No.

331,281

4 Sheets-Sheet 2

Fig. 4.



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4 Sheets-Sheet 3

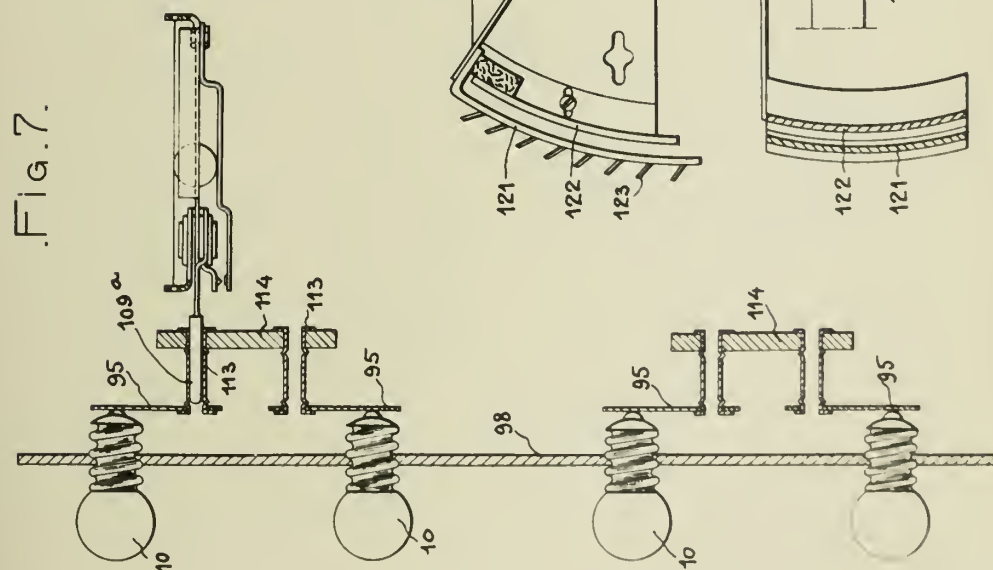


Fig. 7.

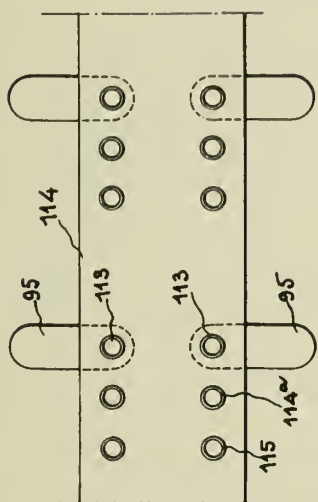


Fig. 8.

Fig. 9.

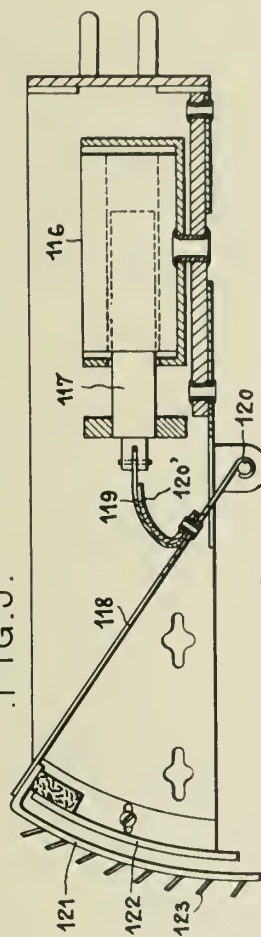
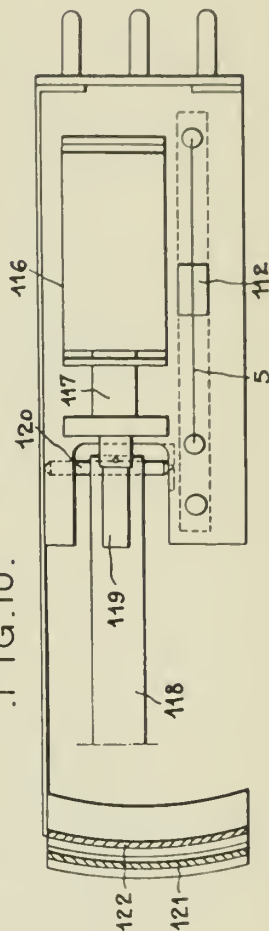


Fig. 10.



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Fig. 11.

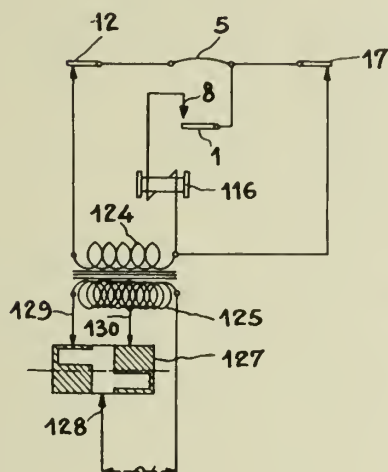


Fig. 12.

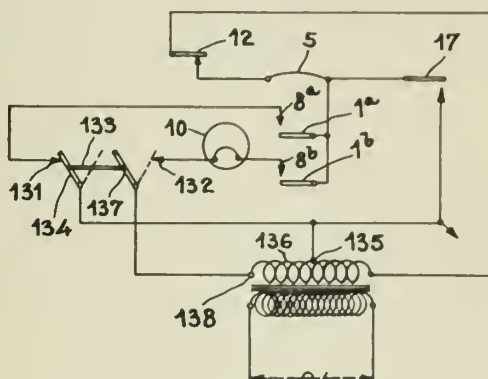
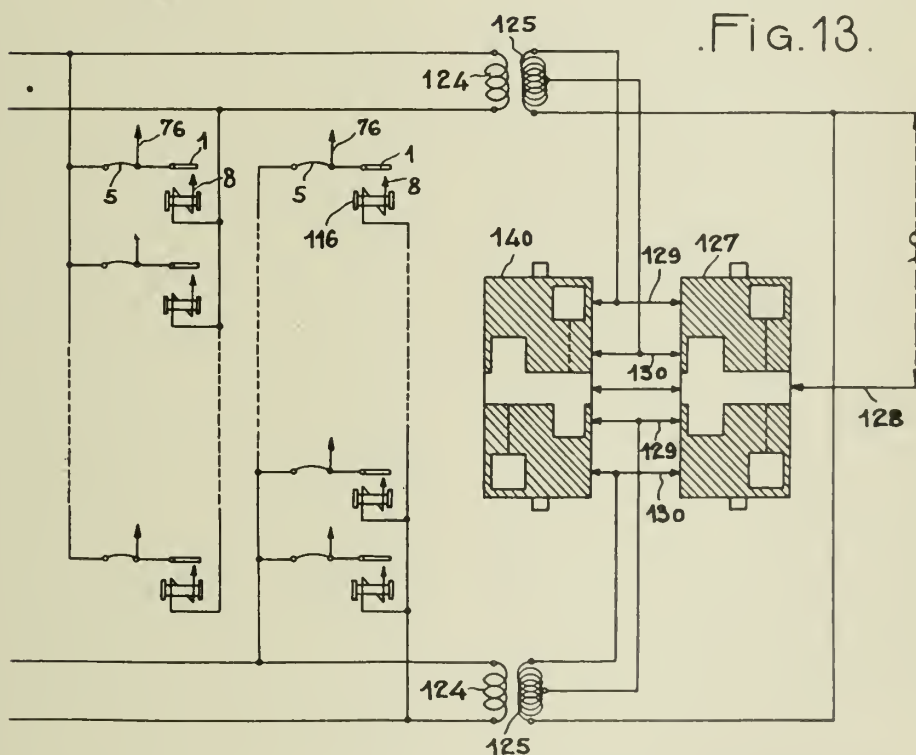


Fig. 13.



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# ALIEN PROPERTY CUSTODIAN

## PROCESS FOR THE PRODUCTION OF ALCOHOL BY FERMENTATION OF SULFITE WASTE LIQUOR OR WOOD-SUGAR MASH

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No Drawing. Application filed April 24, 1940

The fermentation processes for the preparation of alcohol made of fermentable carbohydrates which are industrially employed to a great extent have mostly utilised molasses, potatoes or other starchy material. Besides for a couple of years the waste liquor of the sulfite cellulose production and the so-called "wood-sugar mash" derived from the "saccharification" of wood are also increasingly used for this purpose.

It has been established that the yield of alcohol is increased when the alcohol is prepared by fermentation of sulfite waste liquor and/or wood-sugar mash and furthermore the duration of the fermentation is very essentially shortened which, for instance, makes it possible considerably to reduce in size the fermentation-room, if a small quantity of aneurin is added to the fermenting-mixture, simultaneously taking care that a certain, preferably considerable portion of the yeast-cells as long as possible contributes towards the fermentation of as many new parts of the fermenting solution as feasible.

In the place of aneurin can also be used the phosphoric acid esters, e. g. the mono- or pyrophosphoric acid compounds of aneurin as well as the cleavage-products or preliminary products of aneurin which are still efficacious in the tomato-root test, in other words the derivatives of pyrimidine or thiazol separately or in mixtures of both and with aneurin which are suitable for the formation of aneurin. The favourable action is already distinctly seen if approximately 1 mgm. aneurin or one of the other above-mentioned substances is added to 1 kg yeast (calculated in the form of compressed yeast containing 75% water) which acts during the fermentation. According to the circumstances, of course, also smaller or preferably larger quantities of the above-stated effective substances can be used. In practice it is advantageous to add these substances to the mash prior to the fermentation or to the yeast reconducted to the fermenting-system before mixing same with the mash.

The method of fermentation according to the invention is used for the production of alcohol made of sulfite waste liquor of leaf-wood and plines and their mixtures, furthermore made of wood-sugar mash, viz. sugar-solutions which are produced of cellulose-containing substances by "saccharification" according to one of the well-known methods.

The mash can be fermented discontinuously or in such a way as to be compulsorily and continuously conducted through the fermentation system. The undesirable settling out of the yeast

in the fermenting vat can be prevented in both cases by a mechanical stirring apparatus, rotation-pumps or other suitable means. Open or closed vats can be used in this case. It is appropriate to ferment under the atmosphere of carbonic acid, viz. under exclusion of air. It is sometimes even useful to work with an excess pressure of CO<sub>2</sub> which by way of example can be attained by carrying away the carbonic acid formed by the fermentation over a scrubber filled with water or an adjustable blow-off valve or something of that kind.

According to the invention work should be done under such conditions that a considerable portion of the yeast-cells participate in the fermentation as long as possible or gets in touch with new parts of the fermentative solution again and again by new use as "fresh yeast" or by carrying back the yeast-cells out of the fermented mash to the fresh mash. For this purpose arrangements according to a special fermentation method are suitable where the yeast is kept hold of by structures inserted in the fermentative solution or arrangements according to the method of reconducting the yeast, where the yeast is entirely or partly recovered from the mash completely or incompletely fermented by mechanical resource (e. g. centrifuge) and the recovered "yeast-milk" is again mixed with the fresh mash. When the methods of continuous fermentation are employed a part of or all the yeast is either permanently conducted in circulation through the entire fermentation system or the yeast-milk is for a short time stored in intermediate reservoirs for special treatment of the yeast, e. g. disinfecting, addition of substances which inhibit the vegetative property of yeast etc. before again mixing it with the new waste liquor.

### Example I

When working according to the process by which the yeast is kept hold of by structures inserted in the fermentative solution by way of example, on the average from 7.600 to 7.800 l alcohol are produced by fermentation in 1.000 cbm. of neutralised waste liquor of sulfite cellulose containing 23-24% reducing substances (based on glucose). If 250-500 mgm aneurin are added to each 100 cbm mash, the fermentation lasts only 30 hours instead of 40 hours, and the output of alcohol is increased to an average of 7.800-8.100 l. For the fermentation of further amounts of liquid the quantity of the supplementary agent can be decreased. It is of special advantage to add aneurin all at once to the yeast

put in freshly when the inserted structures are exchanged. Similar results are obtained with aneurin-pyrophosphate or 2-methyl-4-amino-5-hydroxymethylpyrimidine hydrochloride. The method is also correspondingly applicable to the fermentation process of mixing the unfermented mash with mash which is entirely or partly fermented.

*Example II*

When sulfite waste liquor is fermented according to the fermentation method based on the conveyance of yeast using 15-25 kg yeast (containing 75% water) per cbm in a fermentation-room of 500 cbm, 25 gm aneurin or 2-methyl-4-

amino-5-bromo-methylpyrimidine-hydrochloride are added to the fermentation system. Only after weeks or months the addition will be made anew. The duration of fermentation is shortened and furthermore the yield of alcohol is increased on the average by 3% in comparison with the normal value. In case the fermentation process based on reconducting the yeast is carried out by using larger or smaller quantities of yeast than stated above, the quantity of the aneurin addition can be altered correspondingly. In the same way as described by the examples I and II the method can be employed for the wood-sugar mash.

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# ALIEN PROPERTY CUSTODIAN

## AUTOMATIC DISTRIBUTORS OF GOODS

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Alien Property Custodian

Application filed April 27, 1940

This invention relates to a device for the automatic distribution of goods.

The distributing device according to the invention comprises containers which are adapted to receive the different objects to be distributed and are each provided with an electrically driven expeller, adapted to put the single objects out of their container, an electric driving system for the said expellers including a dial combiner allowing to send on a line at will different series of impulses and a selector allowing the selection of the one or the other expeller driving means in relation with the combination established by means of the dial.

The accompanying drawings show by way of example a form of execution of the device:

Figure 1 shows a diagram of the electric circuits controlling the distribution;

Figure 2 is a cross section of the distributor along the line A—B of figure 3;

Figure 3 shows a partially sectioned front view of the same distributor.

The distributing device shown in the drawings has an electric driving system (fig. 1) comprising a push-button T acting on three contact springs 1, 3 and 5 and a dial combiner I of the kind used in telephony for the selection of different circuits. The distributing device comprises further containers (figs. 2 and 3) designed to receive the objects to be distributed and means to effect the distribution.

On the front side of the distributing device a slot is provided for the introduction of a counter or a money M (fig. 1), which on its introduction closes the following circuit: negative pole, springs, a, b, springs 6, 5, springs of the dial giving the impulses, winding of the relays B, positive pole. The relays B is therefore excited and by means of the spring 12 the following circuit is closed: positive pole, spring 12, contact 11 of the relays B, winding of the delayed relays C, negative pole. The delayed relays C is therefore excited and attracts his springs 14 and 17.

Turning now the dial and forming thus a determined number the relays B attracts the spring 12 and releases it at each impulse sent by the dial and as the relays C being delayed remains excited, the coupling magnet  $MS_1$  of the selector  $S_1$  is excited as many times as are the unities contained in the transmitted number.

The exciting circuit of the magnet  $MS_1$  is as follows: positive pole, spring 12 and contact 13 of the relays B, contact 16 and spring 17 of the relays C, spring 25 and contact 26 of the relays E, winding of the magnet  $MS_1$ , negative pole.

With the excitation of the magnet  $MS_1$  the brush  $sp_1$  of the selector  $S_1$  is moved so as to rest on the contact corresponding to the transmitted number, for instance on the contact 2.

On the end of the rotation of the selector the switch H moves from its position signed on the drawing and reaches the position in which its spring 31 makes contact with 30 and the following circuit is closed:

Negative pole, spring 31 and contact 30 of the switch H, spring 19 and contact 18 of the relays D, winding of the relays E', positive pole. The relays E' attracts the spring 23, thus exciting the relays E which attracts the spring 25. If now the second number of the desired figure is formed by means of the dial, the impulses corresponding to the second number are transmitted in the described way not to the magnet  $MS_1$  but to the magnet  $MS_2$  of the selector  $S_2$  and the brush  $sp_2$  of this selector is brought on the contact corresponding to the second number transmitted, for instance on 4.

At the end of the movement of the selector  $S_2$ , the switch L moves so as to close over the contact 35 and its spring 36 the following circuit:

Negative pole, spring 36 and contact 35 of the switch L, spring 20 and contact 21 of the relays D, winding of the relays F, positive pole. The delayed relays F is excited and closes through its spring 27 and the contacts 28 and 29 the following two circuits:

(a) Positive pole, winding of the relays A, resistance  $r_1$  contact 28 and spring 27 of the relays F, negative pole;

(b) Negative pole, spring 27 and contact 29 of the relays F, spring 8 and contact 7 of the relays A, spring 1 and contact 2 of the push-button T, sector 1 of the selector  $S_1$ , brush  $sp_1$  of the selector  $S_1$  (in fig. 1 supposed arrested in position 2), sector 2 of the selector  $S_2$  (in fig. 1 supposed arrested in position 4), contact of 2—4 corresponding to the position of the brush  $sp_2$  of the selector  $S_2$ , winding of the electromagnet 2—4 corresponding to this contact but not shown on the drawing. The electromagnet 2—4 operates the distributing device.

In this way by forming a determined figure with the dial the electromagnet corresponding to the desired distributor is chosen and an exciting current is sent in his winding.

It is obvious that the number of distributors which may be actuated depends on the number of the lines of the selector used.

By exciting the relays A through the spring

10 and the contact 9 of this relais the following three circuits are closed:

(a) Positive pole, winding of the relais R (group of selectors moved), spring 41 and contact 39 of the relais A, contact 33 and spring 34 of the switch H, winding of the magnet  $MS_1$ , negative pole; the magnet  $MS_1$  is excited and the selector  $S_1$  . . . returns . . . to rest position;

(b) Positive pole, winding of the relais R, spring 41 and contact 40 of the relais A, contact 37 and spring 38 of switch L, winding of the magnet  $MS_2$ , negative pole; the magnet  $MS_2$  is excited and the selector  $S_2$  returns to rest position;

(c) Positive pole, winding of the relais G, spring 3 and contact 4 of the push-button T, contact 9 and spring 10 of the relais A, banc of contacts 5 of the selector  $S_2$ , brush  $sp_2$  and sector 0 of the same selector (rest position of the selector), contact 32 and spring 31 of the switch H, negative pole. Then the relais G is excited, so attracting the spring  $a$  and thus the money or counter first arrested by the springs  $a$  and  $b$  leaves its position because the spring  $a$  has been lowered. A box receives the counters introduced in the slot and which have operated the device.

In these conditions all the organs employed are returned in the rest position and are ready to nowly begin the cycle of their movements if a new counter or money is introduced in the slot.

The proper distributor for the objects, shown in the Figures 2 and 3, has a serie of containers D in which the goods or objects E,  $E_1$  to be distributed are introduced. Each container has a piston A on the bottom and an aperture F on the front wall through which the objects may be pushed out the one after the other by means of the piston. Each piston is connected by means of a traversal plate B with the core G of an electromagnet M. These magnets M correspond to those shown schematically on the lower end of Fig. 1.

By exciting the one or the other of the electromagnets in the aforesaid manner, the corresponding piston A is pushed forwards, so producing the expulsion of the object E.

In going out of the container, the object is

guided in a vertical channel to the delivery aperture in the housing of the device. At the end of the core excitation of the magnet M the piston is returned in its rest position by a return spring C. The free room produced by the returning piston A causes the lowering of the pile of goods by gravity and a new object  $E_1$  is ready to be pushed out by the piston.

The device in its preferred form comprises, as shown and explained, a member transmitting current impulses, selectors adapted to move their contact brushes on determined contacts and containers suitably operated.

The transmitter of current impulses is for instance a normal dial of the type used in automatic telephony systems and the selector may be of the kind used in automatic telephone central stations for selecting the numbers.

The dial is electrically connected by means of suitable relais with the magnets, so that by forming a number on the dial current impulses are sent to the selectors which reach the position corresponding to the number formed on the dial.

After having reached this position the selectors are stopped and through their contact brushes and the selected contact bank a current is sent to the mechanism operating the desired distributor.

The dial is free to turn around its shaft but transmits impulses to the selectors only if a contact spring closing its circuit has been closed by means of a metallic counter or a money.

The whole device is fed by a storage battery changed by a rectifier inserted in the low current mains of a public network.

It is to be understood that the invention is not limited to the form of execution described, but comprises also variations and simplifications concerning for instance the operation of the dial, which may be also without combination effect, or concerning the driving and selecting means which may be also mechanical means or which may be multiplied and independent the one from the others.

ANTONINO ALFANO.

PUBLISHED

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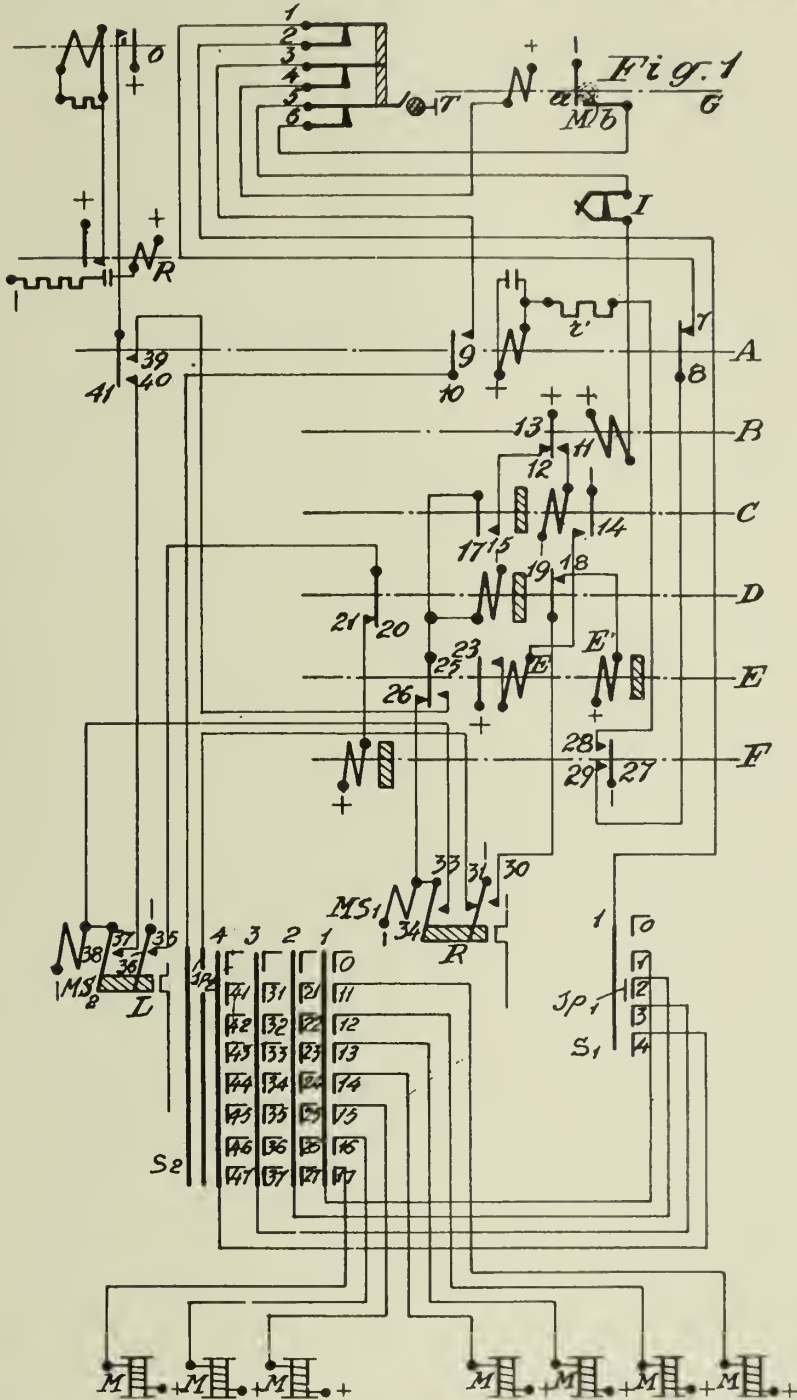
AUTOMATIC DISTRIBUTORS OF GOODS

332,117

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2 Sheets-Sheet 1



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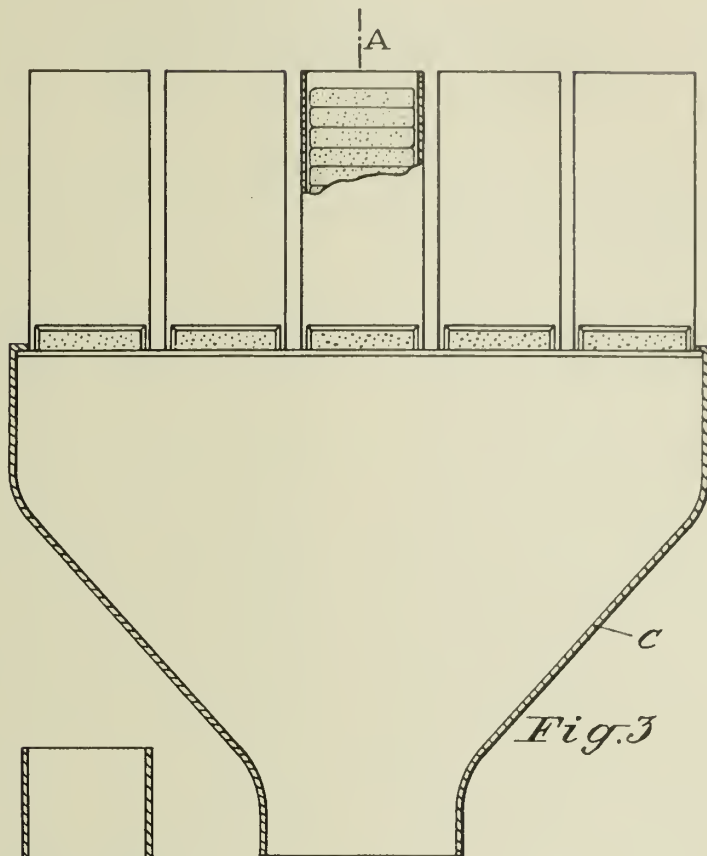
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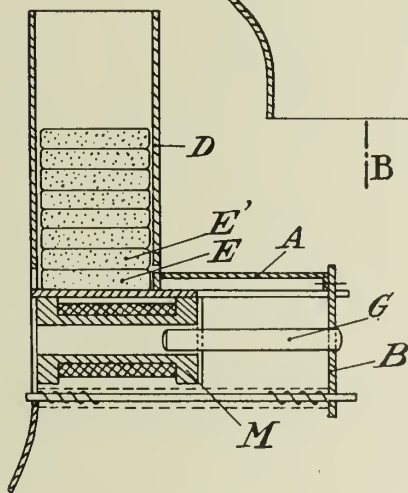
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*Fig. 3*



*Fig. 2*

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# ALIEN PROPERTY CUSTODIAN

## METHOD TO DETERMINE THE ELECTRICAL AXES OF QUARTZ CRYSTALS

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Application filed May 3, 1940

This invention relates to a new and novel method to determine the electrical axes of quartz crystals.

For a great many electrical circuit arrangements, oscillators, resonators, testing devices, etc., the electrical properties of mechanically oscillating or vibrating crystals are utilized. Now, these properties very largely are a function of the orientation of the crystal plates or rods that are used in respect to singular axes of the crystal. For instance, it is known that the temperature coefficient of such a vibrating crystal may be minimized by using suitable sections to a very low level, though very precise orientation is necessary therefor. The significant or characteristic axes are the optical axis and the electrical axes, as shown by Fig. 1. If the quartz has sufficient native faces, the orientation which is desired may be taken along these faces. However, in many cases there are no faces at all or only an inadequate number of them so that other methods must be indicated for the orientation presupposing a crystal lump presenting a wholly irregular surface.

It is possible to define and fix the optical axis with sufficient accuracy and simpleness by methods known in the art, but the methods so far known for determining the electrical axes do not offer any great exactitude at all, though they require quite elaborate means to practice them.

Now, a method will hereinafter be disclosed which is predicated upon the behavior of quartz crystals in respect to etching substances (corrosives or caustics). Etching a quartz crystal with fluoric acid or some other corrosive, there result depressions which exhibit regular limitations or boundary lines. Upon microscopic examination these etched areas are found to resolve into a multiplicity of tiny bodies presenting a sharp and regular form. As a matter of fact, these actions caused by etching are known. By surface etching of a regular crystal, it is possible to ascertain the optical rotatory power thereof, also inter-crescences and twin formation. Platelets cut out of a mother crystal evidence similar etching actions. Now, these according to this invention are to be used for a determination of the electrical axes.

Etching a quartz plate cut at right angles to the optical axis three-faced rhomboidal corners with sharply developed edges result upon etching with fluoric acid. These edges present in reference to the natural edges and thus to the

electrical axes a very definite geometric position. However, to know this orientation does not yet suffice to determine the electrical axes seeing that the same is found to differ according to the way the cut is made along the optical axis. Essentially, differentiation is made between three orientations, one thereof corresponding to the prismatic part of the quartz and two to the pyramidal part thereof. Moreover, the orientation will differ according to the optical sense of rotation, though this case needs no special investigation because it can be determined priorly.

In other words, investigation may be restricted to the three most essential instances illustrated in Fig. 2. Referring to Fig. 2, it will be seen that in the first place the outer edges of the three-faced corners are parallel to the electrical axes (b) and then they are at right angles thereto (a), but in the third case (c) orientation is entirely different. Describing an equilateral dodecagon about the crystal hexagon as shown by the dash-lines in Fig. 2, it will be seen that the sides of the dodecagon positioned in accordance with the outer edges of the corners are parallel, which means that exact orientation is feasible also in this case.

To ascertain and answer the question as to which case is dealt with, that is, how the section is laid through the crystal at right angles to the optical axis, a rough determination of the electrical axis must be made. This is accomplishable with adequate accuracy by the aid of Kundt's well-known dust figures or patterns. By means of some proximate orientations the proper case is easily ascertainable.

In other words, there results the following procedure for determining the electrical axes: After correct orientation of the plate or the mother crystal at right angles to the optical axis, the optical rotation is determined with the same devices. Then, following the preliminary orientation by the aid of Kundt's dust figure test. Next, the crystal is etched and the outer edges of the three-face corners fixed. For this purpose, a microscope is required, the magnifying power of which is chosen according to the desired accuracy. Knowing the sense of rotation of the preliminary orientation and the exactly fixed etching edges in combination result in a very precise determination of the electrical axes.

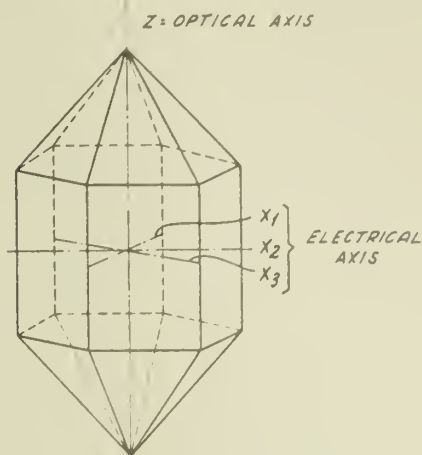
RUDOLF BECHMANN.  
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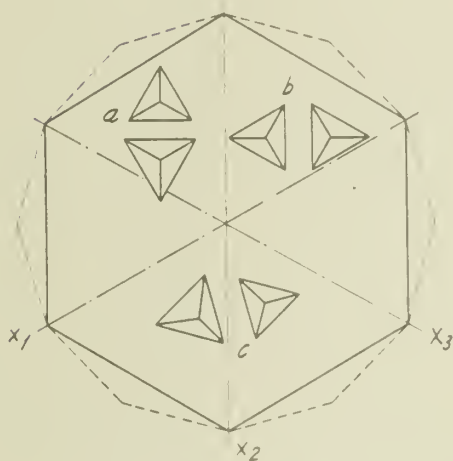
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*Fig. 1*



*Fig. 2*

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# ALIEN PROPERTY CUSTODIAN

## INTERFERENCE SILENCER MORE PARTICULARLY FOR INTERNAL COMBUSTION ENGINES

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Application filed May 3, 1940

It is known to use for damping sound, more particularly in internal combustion engines, so-called interference dampers, in which various pipes are branched off from the main sound pipe and are led back again to the main pipe. These branch pipes have for their object to produce such a phase displacement, owing to their longer path relative to the sound vibrations in the main pipe, that the oscillations or vibrations re-entering from the branch pipes and the vibration in the main pipe are eliminated through interference. It is also known that a damping is attained by making the by-pass pipe longer to the extent of a half wave-length of the over-vibration to be damped. Since, however, in connection with each individual branch pipe, interferences can only occur for a single oscillation or vibration, while the other branch pipes allow of the passage thereof and again damp other oscillations or vibrations by interference, a frequency assembly of the noise is absolutely invisible and unpredictable at the common inlet of the branch pipes. For this reason, the oscillations are only slightly damped behind the group of branch tubes, in the sound pipe.

According to the present invention, an extensive and regulatable sound damping is attained in that the length of the first branch pipe is greater to the extent of one half wave-length of the 1st over-vibration than the bridged length of the sound main pipe, the second branch pipe is longer to the extent of one half wave-length of the 2nd over-vibration than the bridged length of the main pipe and the third branch pipe is longer to the extent of one half wave-length of the 4th over-vibration than the bridged length of the sound main pipe and the fourth branch pipe is longer to the extent of one half wave-length of the 8th over-vibration than the bridged length of the sound main pipe etc., whereby the 1st, 3rd, 5th, 7th, 9th . . . over-vibration will be damped by the first branch pipe; the 2nd, 6th, 10th, 14th, 18th . . . over-vibration will be damped by the branch pipe 3; the 4th, 12th, 20th, 28th . . . over-vibration will be damped by the branch pipe 4; and the 8th, 24th, 40th, 56th, 72nd . . . over-

vibration will be damped by the branch pipe 5.

A constructional example is shown diagrammatically in the accompanying Figure.

Branch pipes 2, 3, 4, 5, etc. branch off the sound pipe 1 successively. The interference tube 2 damps the 1st over-vibration while the interference tubes 3, 4, 5, etc. damp the 2nd, 4th, 8th etc. over-vibration. For this purpose the length of the branch pipe 2 is greater to the extent of one half wave-length of the first over-vibration than the bridged length or zone 1' of the sound pipe 1. The length of the branch pipe 3 is longer to the extent of one half wave-length of the 2nd over-vibration than the bridged length or zone 12 of the sound pipe 1. The lengths of the branch pipes 4, 5, etc. are therefore longer to the extent of one half wave-length of the 4th, 8th etc. over-vibration than the corresponding bridged lengths or zones 13, 14 etc. of the sound pipe 1.

In the arrangement according to the invention, not only the 1st, but also the 3rd, 5th, 7th, 9th, etc. over-vibrations are damped by the interference tube 2. In addition to the 2nd, also the 6th, 10th, 14th, 18th, etc. over-vibrations are damped by the interference tube 4. In addition to the 4th, also the 12th, 20th, 28th etc. over-vibrations are damped by the interference tube 5. In addition to the 8th, the 24th, 40th, 56th, 72nd etc. over-vibrations are damped by the interference tube. Consequently, practically all frequency individual noises can be eliminated by a corresponding arrangement of further branch pipes.

In an apparatus according to the invention, the branch pipes are arranged in series, one behind another, so that the entire frequency is successively diminished relatively to the damping of the preceding interference tubes in the following branch pipe. The sequence of the interference tubes may be chosen at will. By means of this series arrangement of the interference tubes, a passage of frequencies, which are damped in a branch pipe, will be prevented by the other branch pipes.

HERBERT MARTIN.



PUBLISHED

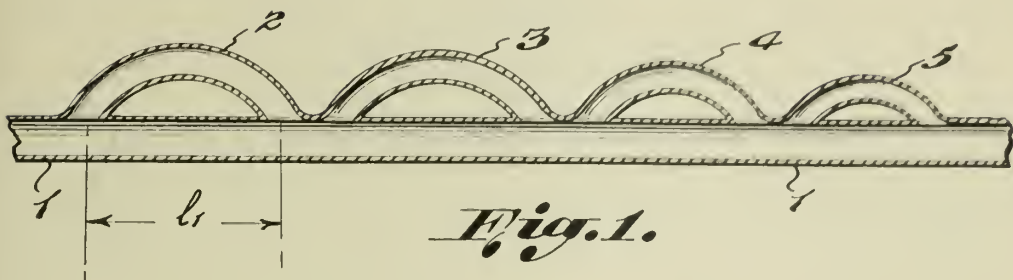
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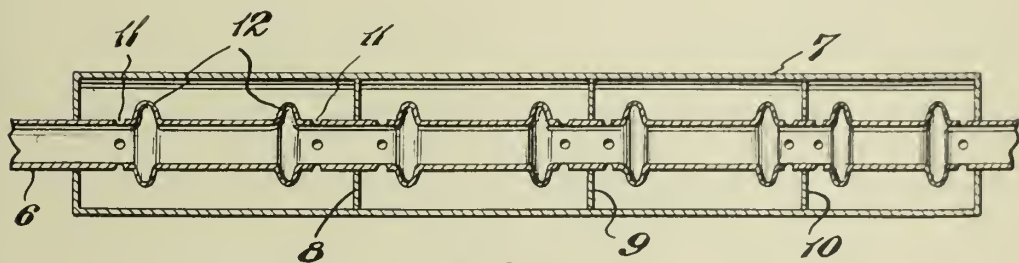
H. MARTIN  
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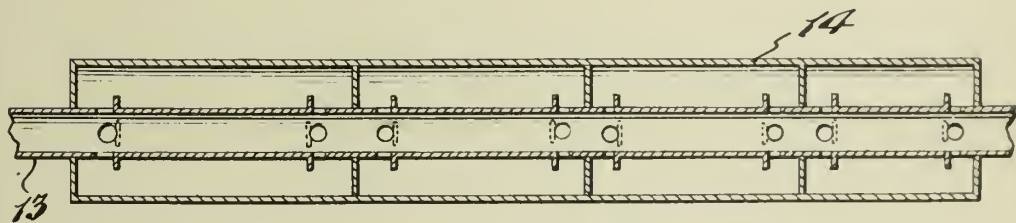
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*Fig. 1.*



*Fig. 2.*



*Fig. 3.*

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# ALIEN PROPERTY CUSTODIAN

## RESISTANCE ELECTRIC WELDING MACHINES

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Application filed May 3, 1940

Electric welding machines have long been described in which use is made of power accumulation in a static condenser which is discharged in the primary winding of a transformer in order to execute the weld.

Usually in such machines, direct current generators or rectifiers of known types are used for charging the condensers.

In my co-pending application filed ——— Serial No. ——— entitled "Improvements in resistance electric welding machines, I have proposed the use of synchronous commutators comprising a rotating mercury jet or jets for supplying resistance welding machines of all kinds and controlling the operation thereof, as well as various improvements in these commutators.

The present invention is a further development of these proposals and the main object thereof is the use of rotating mercury jet commutators and particularly those described in the said application, for controlling the operation of welding machines operating with a condenser discharge.

It is known that the charging of a condenser under constant potential is obtainable with an efficiency of 0,5 only. Thus it is of interest to ensure the charge under variable potential and rotating mercury jet synchronous commutators enable this requirement to be fulfilled. On the other hand it is also known that the discharge time of a condenser in a circuit including a resistance and a reactance is governed by a law depending on the values of the capacity, of the resistance and of the reactance.

The constructional conditions of a welding machine do not always permit to conciliate easily the values imposed by the utilisation and constructional requirements with the values giving the most favourable durations for the flow of the current. In certain cases, a lowering in the efficiency of the welding machine must be allowed to secure a flow of sufficiently extended duration. On the other hand, the use of a discharging wave of constant direction and relatively long duration results in a very bad utilisation of the electrical part of the welding machine.

To avoid these difficulties, two or more successive condenser discharges has been used, and the use of rotating mercury jet commutators enables such a cycle of operation to be applied.

The annexed drawing shows an arrangement embodying the object of the invention.

In this drawing, all the auxiliary members of a welding machine, as well as the driving devices thereof which are useless for the understanding of the invention, have been omitted in order to simplify the description.

Referring to the drawing, 1 and 2 designate the two supply mains of the machine. These mains feed the primary winding 3 of a transformer 4,

the secondary winding 5 of which is provided with several tapping points providing for several potentials of increasing values. One end 6 of this secondary winding is connected with one or two or a multiplicity of condenser batteries as well as with the primary winding 9 of the welding transformer 10.

With each of the tapping points 11, 12, 13, 14 and 15 is connected one of the contact pieces 16, 17, 18, 19, 20 and 21, 22, 23, 24, 25 of each of the two rotating mercury jet commutators used.

Naturally, any number of tapping points may be used without exceeding the spirit of the invention.

The contact pieces of the two commutators which are connected to the same tapping point are displaced with half a period in such a way that the mercury jet 26 allows for the passage of the current in one direction only, while the mercury jet 27 allows for the passage of the current in the other direction only. The length of these contact pieces is suitably selected so that the cut-out takes place with an intensity having zero value or a very small value only. Through the mercury jets 26 and 27 the condensers 7 and 8 are connected in succession with the tappings 11, 12, 13, 14 and 15, and consequently these condensers 7 and 8 will be charged in opposite directions. The charge takes place under increasing potential, that is in the best conditions of efficiency. After the charging operation, the mercury jet 26 strikes the contact piece 28 which is connected to the primary winding 9 of the transformer 10 and thus the condenser 7 will discharge in this transformer. When the mercury jet 26 is leaving the contact piece 28, the mercury jet 27 will strike the contact piece 29 and cause the discharge of the condenser 8 in the primary winding of the transformer 10, but in the opposite direction.

It will be seen that the above described arrangement enables the charge of condenser batteries to be obtained under the best possible conditions and also the passage through the primary winding of a welding transformer of several successive discharges of two or more charged condensers, successively in opposite directions.

Naturally the device may be arranged to be fed with bi- or triphased supply systems, and it may be used with any desired number of condenser batteries without exceeding the spirit of the invention.

Also all the welding elements may be modified in the course of the operation, and particularly condensers of different capacities may be used for the successive discharges, or condensers having the same capacity may be charged under different potentials, or the pressure on the weld may be modified during the operation.

JACQUES EMILE JULES LANGUEPIN.



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J. E. J. LANGUEPIN

Serial No.

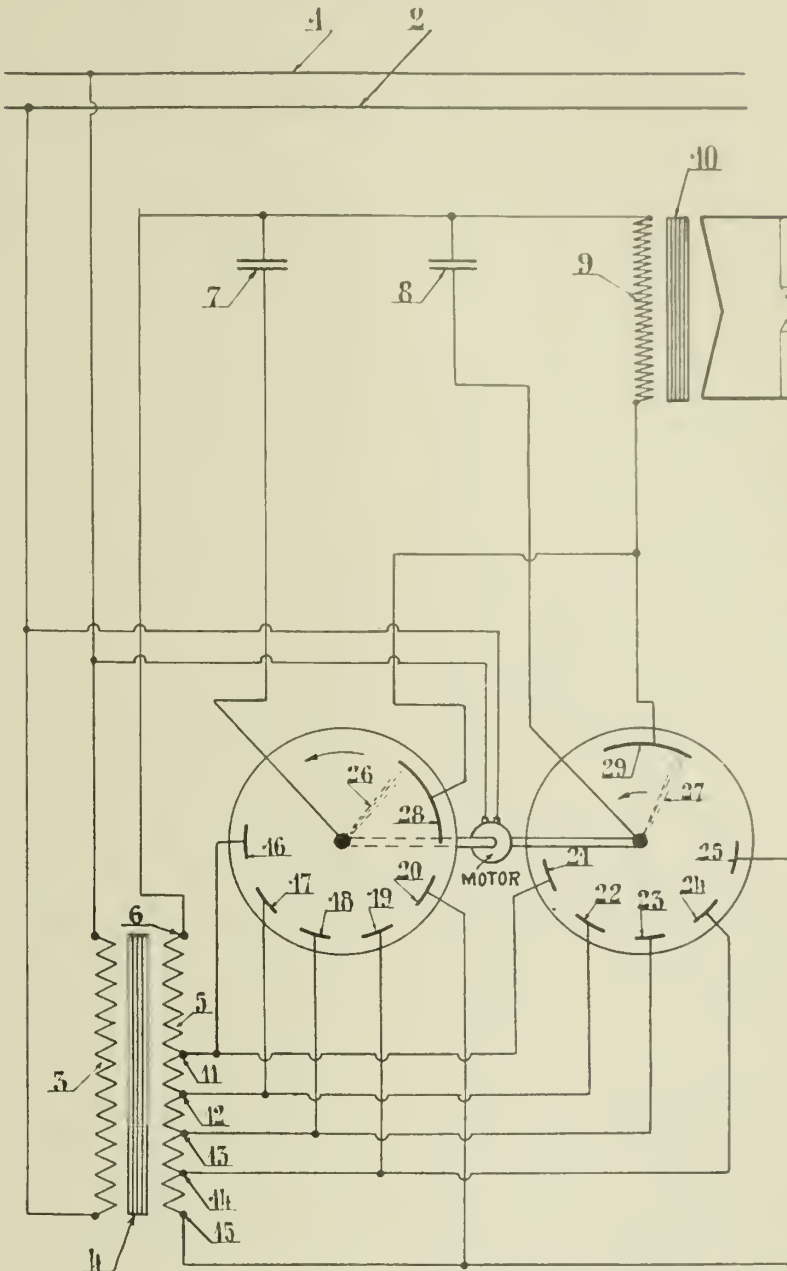
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RESISTANCE ELECTRIC WELDING MACHINES

333,242

BY A. P. C.

Filed May 3, 1940



Inventor;  
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# ALIEN PROPERTY CUSTODIAN

## METHOD AND MEANS FOR DETERMINING AND TRACING INSULATING, IN PARTICULAR OIL-CARRYING STRATA

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Alien Property Custodian

Application filed May 6, 1940

My invention relates to methods and means for determining and tracing geophysical strata of insulating character, in particular oil-carrying beds, by measurements taken at the earth surface.

The seismographic reflection method has proved successful in mines for determining the presence and approximate location of strata of high density. According to this method, a surge of pressure waves is sent through the ground. If the surge meets a stratum of high density, in particular of rock, it is reflected. The reflected surge is observed and measured at the surface and the lapse of time between the emission of the surge and the return of its reflection is used as a basis for calculating the depth of the reflecting stratum. This method affords a determining of subterranean rock formation but cannot be used for detecting or tracing oil-carrying porous strata because they do not reflect sound waves.

By means of electromagnetic waves produced, for instance, by imparting oscillatory discharges to the soil as described in U. S. Patent No. 2,077,707 to B. S. Melton, electrically-conductive strata embedded in a non-conductive medium may be detected by observing the reflection of the waves from the conductive layer. This oscillatory method, however, does not allow tracing insulating strata covered by a conductive medium such as oil-carrying beds below a water-containing stratum. The electromagnetic or electric oscillations, when passing through a conductive medium, are dampened so that they do not reach the oil-carrying bed, and, besides, they penetrate such insulating beds without appreciable reflection.

An object of my invention is to provide a method which allows determining and tracing subterranean strata of marked insulating character, in particular oil-carrying beds, with the aid of measuring means as easily applicable as those required by the aforementioned seismographic methods. Another object of my invention is to provide a method for the above-mentioned purpose which affords results of a particularly high degree of accuracy and unequivocalness. An object also is to improve the apparatus, necessary for geophysical reflection methods, as to simplicity and reliability, in particular by providing a combined transmitting and receiving apparatus which does away with switching apparatus and other mechanical devices to be actuated during the measuring periods.

According to my invention, non-oscillatory surges of an electric charge are supplied to the ground in a shock or explosion-like manner and in such a way that they decay aperiodically. These aperiodic surges spread in the ground, and when meeting an insulating, in particular oil-carrying, bed, are impeded and reflected to the

surface. The reflected charge arriving at the surface is received by means of electric receiving devices as used for radio and telegraphic purposes, and is made visible by means of an oscillograph or the like, in particular with the aid of a cathode-ray oscillograph. This oscillograph is caused to indicate the decaying curve of the original aperiodic charge so that the reflected charge is manifested by its modifying effect on the decaying curve. The measuring of the time elapsed between the emission of the original surge and the receipt of its reflection, in consideration of the previously determined speed of propagation of the charge in the ground, is used as a measure for determining the depth of the reflecting stratum in a way similar to that used in the seismographic reflection method.

A further improvement is obtained according to my invention if the just-described electric reflection method is used in combination with a seismographic method, i. e. in combination with the aforementioned reflection method operating with pressure or sound waves. If at first the aperiodic discharge method is employed and then a seismographic method operating with sound waves, a clear and unequivocal result is obtained. If, namely, in a given case, a reflection is observed with both methods, this indicates the presence of a dense stratum of insulating character, for instance rock formation. If only a reflection of the electric charge but not of the sound waves occurs, this indicates the presence of an insulating bed of low density and hardness. Beds of such character are especially apt to carry oil or natural gas.

According to another aspect of the invention, the transmitter and the receiver used for emitting the electrical charges and for receiving their reflection, are both connected with a common oscillographic apparatus and maintain this connection during the measuring periods. By virtue of this feature of the invention, switching and other mechanical apparatus heretofore used for sequentially connecting the transmitter and receiver with the recording means are eliminated, together with the constructional intricacies and the sources of possible faults and disturbances of the prior devices.

The invention will be readily understood from the following description of the embodiments of the invention shown in the drawing, in which—

Fig. 1 shows a diagram of a transmitter for imparting aperiodically abating discharges to the ground.

Fig. 2 is of explanatory nature and indicates the effect of a reflection of the discharge from an insulating stratum as appearing in an oscillograph.

Figs. 3 and 4 illustrate diagrammatically two

other types of electric transmitters applicable in accordance with my invention,

Fig. 5 represents in diagrammatic form another embodiment of my invention including a transmitter and a receiving cathode-ray oscillograph, and

Fig. 6 shows schematically a vehicle for effecting measurements in accordance with my invention.

The transmitter shown in Fig. 1 is of the Marconi type as used in the first period of wireless telegraphy. A is an antenna of relatively high capacity. F represents a spark gap between spherical electrodes, and T a transformer which is connected with an alternating current source S of high voltage. B is a carefully grounded conductor. As soon as the tension in the secondary winding of the transformer T reaches a sufficiently high magnitude, a spark discharge occurs in the spark gap F so that the electric charge of the system flows through conductor B into the ground. The rate of change of the current in conductor B, or of the voltage on B as compared with the effective zero value appearing immediately after each spark discharge, is represented by curve c in Fig. 2. A current or voltage curve of this aperiodic type is obtained if the resistance of conductor B is relatively high as is indicated in Fig. 1 by a resistor E. If the spark gap F is replaced by a quenched spark gap which prevents a return flow of the electric charge to the antenna A, the discharge occurs in accordance with the asymptotic curve c in Fig. 3 even if conductor B has a small resistance, i. e. if resistor E is omitted.

If the transmitter is above an oil-carrying insulating bed, the electric charges emitted are reflected and the reflection manifests itself by influencing the rate of change of the current and voltage in conductor B. The curve c indicated in Fig. 3 assumes a shape as exemplified by the broken line curve d. The interval t indicated in Fig. 3 represents the time elapsing during the travelling of the charge from the transmitter at the surface through the ground to the insulating stratum and during the return of the reflected charge to the receiver at the surface.

In certain cases, a repeated reflection may be observed which results in a somewhat wavy current or voltage curve. The curve d in Fig. 3 is of such character. After the speed of propagation of the electric charge in the upper strata of the ground in the area to be traced has been previously determined by test measurements, the time interval t affords a measurement of the depth of the oil-carrying stratum.

Instead of an antenna, a high tension condenser may be used as is illustrated in the transmitting arrangement shown in Fig. 3. The condenser C may consist of a battery of Leyden jars or similar electricity accumulators, and the discharge circuit or the arc gap itself should be of such resistance and design, respectively, as to ensure a substantially non-oscillatory discharge current having the desired rate of decay. The return conductor D leading from the condenser arrangement to the ground is preferably arranged at a large distance from the grounding electrode of conductor B. The effect of a reflection from a subterranean stratum is strongest if one of the electrodes is located directly above the oil-carrying stratum while the other electrode lies outside the range of the stratum. Therefore,

when moving the measuring arrangement along the surface above an oil-carrying bed and making measurements at given distances, the approximate extent and limits of the oil-carrying bed may be determined by observing the occurrence and disappearances of reflections.

The galvanic connection of the measuring arrangement with the ground can be replaced by a positive coupling, as exemplified by Fig. 4. In this figure, A<sup>1</sup> represents an antenna and A<sup>2</sup> a counterpoise, i. e. a second antenna, which is arranged near the ground but insulated therefrom. The antenna A<sup>1</sup> may consist of an insulated metal structure forming the roof of a measuring vehicle, while the counterpoise A<sup>2</sup> consists of an insulated metal structure arranged at the bottom of the vehicle. It then is possible to determine and trace oil-carrying beds while travelling over the surface and without using grounding electrodes. A measuring vehicle as described, in the form of a wagon or trailer, is schematically represented in Fig. 6. The antenna A<sup>1</sup> forms an insulated roof and the counterpoise A<sup>2</sup> consists of an insulated metal structure underneath the bottom of the vehicle.

The oscillograph and the receiving circuit for its operation are preferably connected with the transmitting circuit of the measuring device. Fig. 5 illustrates a schematic diagram of a complete arrangement. G designates a transmitter capable of producing sudden discharges of high energy. This transmitter is of the aperiodic type and may consist of a quenched spark gap. K represents an electrode-ray oscillograph. The oscillograph is electrically coupled with the transmitting circuit by means of a receiver indicated by H. The circuit of this receiver, which also includes the control and sweeping circuit of the oscillograph K, is preferably so designed that the oscillograph is actuated in dependence upon the emission of an electric charge. To this end, the sweeping circuit of the oscillograph K is, for instance, so connected with the circuit of the transmitter G that the oscillograph starts operating as soon as a discharge occurs. Suitable cathode-ray oscillographs and the appertaining operating network are known for other measuring purposes and therefore not illustrated in detail. An electron-ray oscillograph applicable for the purpose of the present invention is, for instance, described by A. Bigalke in the periodical "Zeitschrift der AEG, Mess- und Fernmeldetechnik," Vol. 1, No. 2, page 105. Another description of such a cathode-ray oscillograph is published by A. Bigalke and H. Pieplow in the "Elektrotechnische Zeitschrift," Vol. 16, No. 12, 1939, pages 357 to 359. Such oscillographs are also manufactured and distributed by the Philipps Co. in Eindhoven, Holland.

Due to the operation of the sweeping circuit of the oscillograph in dependence upon the release of an electric charge by the transmitter, the curves appearing on the screen of the oscillograph after each spark discharge, are identical under similar conditions so that, provided the sequence of discharges is sufficiently fast, only one appears as a stationary image. As soon as a reflection occurs manifesting the presence of a subterranean insulating stratum, the curve assumes a distorted shape as explained above with reference to curve d in Fig. 2.

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PUBLISHED

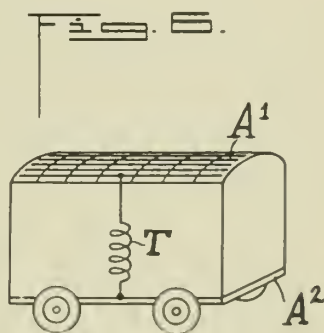
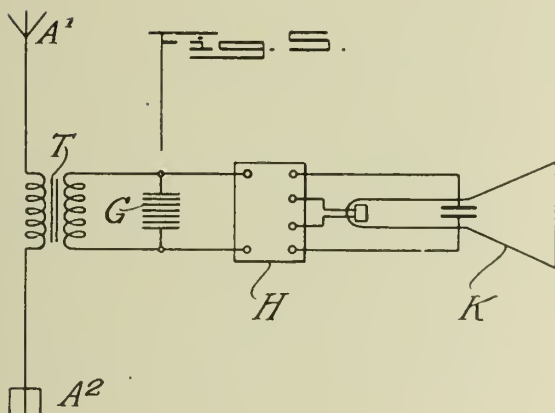
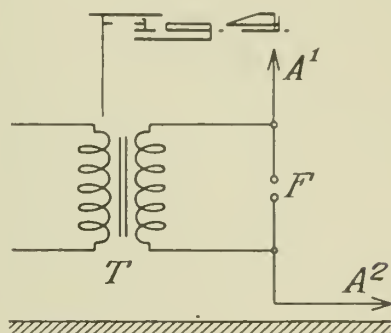
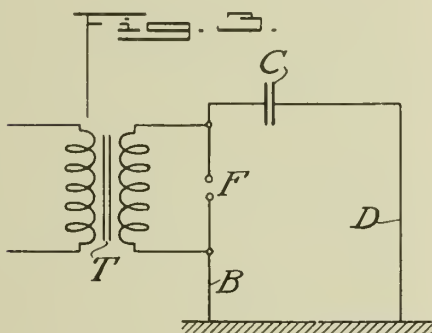
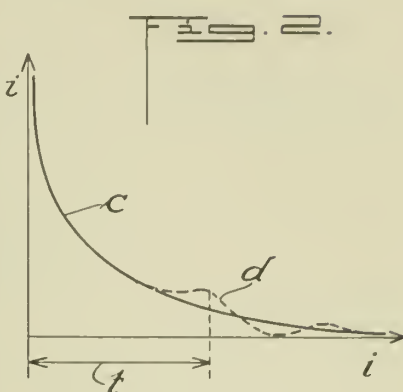
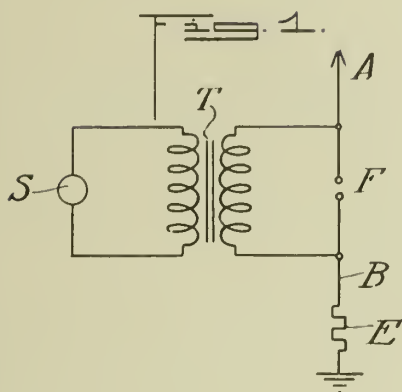
MAY 18, 1943.

BY A. P. C.

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METHOD AND MEANS FOR DETERMINING AND  
TRACING INSULATING, IN PARTICULAR  
OIL-CARRYING STRATA  
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# ALIEN PROPERTY CUSTODIAN

## DRYING PLANT FOR GAS

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This invention relates to the drying of gaseous fluids such as any gas, or air for any purposes.

The devices for drying gaseous fluids by means of substances such as silica-gel, activated alumina, carbagel (dissimulated calcium carbide) etc., have to be arranged in such a manner as to allow the dehydrating substances to be regenerated when having been satiated with water without it being necessary to effect any dismounting of any part of the apparatus, in order as well to save time as to avoid any injury of the dehydrating substances.

The apparatus used in such a purpose are to be so provided as to allow the passage of cold gases containing vapours of water or of any liquid substance, which has to be absorbed by the dehydrating substances contained in the apparatus. After a total or partial satiating of said substances, same are submitted to a heating, generally speaking, obtained by causing said substances to be crossed by a current of hot air, and the absorbing substance is then ready for being anew utilized. Above operations are indefinitely resumed.

For some of the products so used, the temperature of regeneration is very high and may attain for instance 300° C., so that the alternances of heating and of cooling cause the apparatus which contains the dehydrating substances to be subjected to very important variations of temperature which result in an injure of the walls of the metal apparatus. Said metal walls moreover chemically act upon some of the dehydrating substances so that said apparatus receive a duration more or less reduced so that the drying operations of gases are very expensive, whilst in some instances the dried gases loose their purity.

The inventor noticed that the apparatus constructed of ceramic substances, and more particularly of asbest cement, are particularly resisting in the conditions of work which have just been described.

Moreover, the asbest cement allows the construction of any dimensions of apparatus measuring up to several meters in diameter or in height, the vessels perfectly resist to any chemical action and are not sensible to repeated effects of expansion and contraction caused by frequent changes of temperature, and the Inventor has recognized that they give any satisfaction for this especial application.

It is further noticed that the asbest cement is a very good heat insulating substance, which is a very important particular for the operation of regeneration.

The plant according to this invention thus comprises, in combination with a tank or vessel of any convenient dimensions made of a ceramic substance, and more particularly of asbest cement, and containing a convenient dehydrating substance, a piping device which allows the circulation, through the absorbing substance contained in the apparatus, of either a fluid to be dried or in an inverted direction, of a gas such as for instance air brought to a convenient temperature for the regeneration of the dehydrating substances, with a view to allow said regeneration to be obtained without any handling of said substances, and without the apparatus being anyhow injured by the treatment.

In the accompanying drawings which show as an example of an embodiment of the plant according to this invention a constructional form of a plant for drying air:

Fig. 1 is a perspective view of the drying plant allowing a continuous drying of air to be obtained.

Fig. 2 is a diagrammatical axial cross section of said plant.

As shown in the drawings, and more particularly in Fig. 1, the device comprises any number of drying elements comprising each a drying vessel such as 1, 2. Each of said elements is constituted by a tower 3, or 3a (Fig. 2) of asbest cement, containing an absorbing substance diagrammatically shown in 4, 4a (in Fig. 2). Said substance 4, 4a is contained in an annular recipient having vertical circular foraminated walls 5, 6, said recipients which are piled up in the tower 3, being separated by full horizontal wall, such as 7, whilst the lower one directly rests upon the body 8 of the tower 3. The row of such annular recipients is closed at the upper end by a cover 9. This arrangement thus provides inside every tower 3, or 3a a central canal 10 or 10a, obturated at its upper end by the cover 9, or 9a, and an annular canal 11, or 11a located round said annular recipient and limited by the circular wall of tower 3 or 3a.

The canal 10 or 10a is connected at its lower end with a pipe 12 or 12a connected with the delivery side 13 of a centrifugal pump 14 which is actuated by any convenient motor not shown in the drawing. Valves 15 and 15a are located in said pipes 12 or 12a allowing the canals 10 or 10a to be put into communication with said pump 14.

Fixtures 16, 16a, respectively with valves 17, 17a are provided on pipes 12, 12a, thus allowing

said pipes to be put in communication with the open air.

The towers 3, 3a are in communication with their upper ends with pipes 18, 18a which communicate through valves 19, 19a, with a common delivery pipe 20.

The pipes 18, 18a are connected with each other by a transversal canal 21 provided with valves 22, 22a said canal being in communication with a vertical chamber 23, the lower end of which is in communication through a valve 24 with the delivery side of the centrifugal pump 14. A heating electric resistance 25 is located inside said chamber 23 and may be connected by means of the commutator 26 with any supply of electric current not shown in the drawing.

The operation is as follows:

For obtaining dry air the tower 3, for instance, is brought in communication through its valve 15 with the delivery side 13 of centrifugal pump 14. Valves 15a, 17 and 24, are closed. At the upper end of the device, valves 22, 22a, 19a, are closed, valve 19 being open.

The air forced by the pump 14 enters canal 10 and passes through the perforated wall 5 for circulating inside the absorbing substance 4 contained in the piled up recipients. Such air is thus dried and is collected in the annular canal 11 and is forced into the delivery pipe 20.

Once the dehydrating substance 4 contained in the tower 3 having been satiated, the valves 15a and 19a are opened, in order to allow the air to pass through the tower 3a for being dried, valves

15, 17a and 19, being closed, valves 24, 22, and 17, being opened. The dry air is thus delivered through pipe 20 by tower 3a, whilst the air forced by the pump 14 is in part derived by valve 24 into chamber 23. Said air is heated in the contact of the heating electric resistance 25, and passes through valve 22 into tower 3 and passes through the satiated substance 4 thus regenerating same before collecting into canal 10 and being sent into the open air through fixture 16 and valve 17. It is to be noticed that the regenerating air passes through the substance 4 in a direction opposed to the normal direction of the gas or fluid to be dried.

Once the substance 4 contained in the tower 3 conveniently regenerated, the substance 4a contained in the tower 3a, having, during this time, been satiated, the currents of air are inverted in said towers 3 and 3a by conveniently manoeuvring the several valves, thus allowing the air to be dried by circulating into tower 3, whilst the dehydrating substance contained in the tower 3a is regenerated by the circulation of hot air.

It is of course possible to use any desired number of towers such as 3 and 3a with one and the same delivery pump, such as the centrifugal pump 14, the electric resistance such as 25 having any desired shape and arrangement.

It is obvious also that the heating of regenerating air could be effected by means of any source of heat.

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DRYING PLANT FOR GAS

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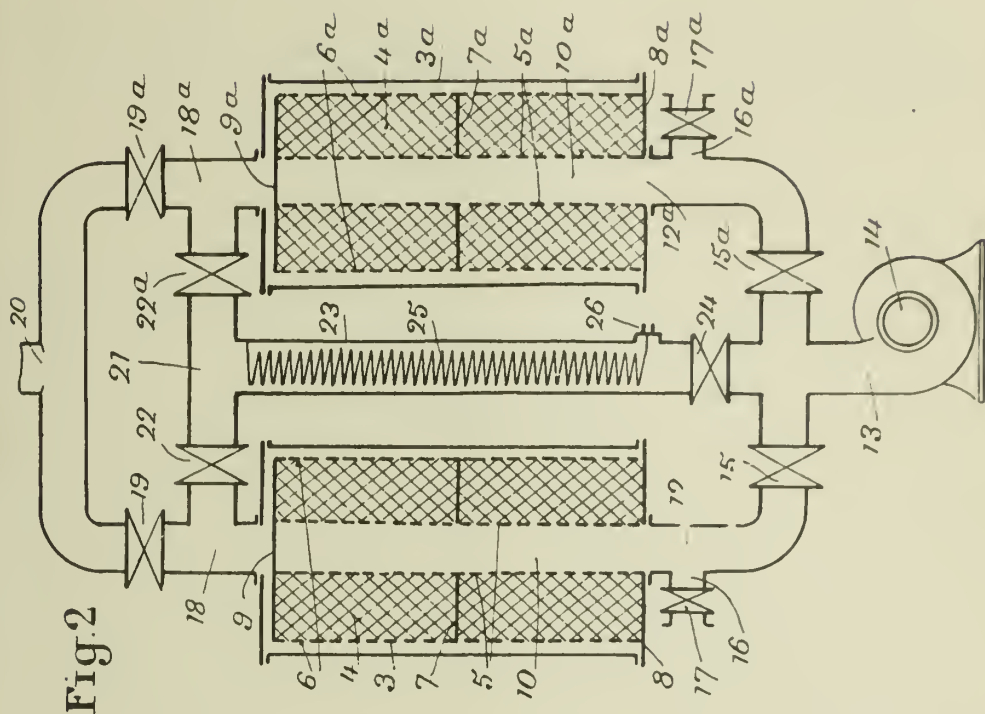


Fig. 2

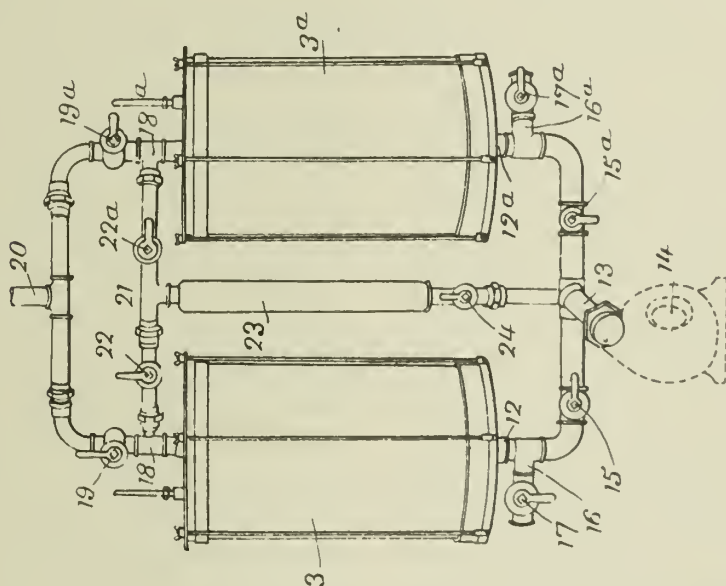


Fig. 1

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ALIEN PROPERTY CUSTODIAN

RESISTANCE ELECTRIC WELDING  
MACHINES

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vested in the Alien Property Custodian

Application filed May 7, 1940

Resistance electric welding machines are now more and more frequently used which are very powerful, complete the weld in a very short time and are held to supply the weld with a very accurately measured quantity of energy. In certain cases the pressure and the current intensity require to be varied during a welding operation the duration of which is only a short time.

Considerable difficulties are experienced in accurately fulfilling the several conditions or requirements above indicated.

Numerous devices have been proposed, and particularly either synchronised mechanical apparatus or thermionic switches are frequently used.

The object of the present invention consists in making use for that purpose of rotating mercury jet commutators enabling the synchronisation of the current set up and cut off and of the control of all the operations to be obtained.

Rotating mercury jet rectifiers are known since long and apparatus of this kind have been used for long periods in order to transform direct current into alternating current.

However it does not appear that these apparatus have been used as switching devices or commutators and to the best of the knowledge of the applicant their application to resistance welding machines has not yet been proposed.

The rotating mercury jet rectifiers commonly used always include a synchronous motor driving a shaft which in most cases is provided with blades forming the mercury pump. The mercury drawn from a tank is forced through a rotating horizontal pipe and the formed jet strikes contacts distributed around a circumference. The whole structure is generally enclosed in a case filled with lighting gas, nitrogen or preferably hydrogen or helium.

Although such an apparatus may be used with advantage with certain simple driving arrangements of welding machines, for example for current modulation of continuously operated welding machines, it does not generally suffice to answer the requirements of somewhat more complicated welding operations.

To meet this purpose, coils are arranged in the vicinity of the jet, adapted to deviate the mercury jet by an electromagnetic field acting on the current flowing through the jet.

Synchronous rotating switches show the drawback to remain in phase with the tension and not with the current. Thus it will be necessary to provide for the setting thereof by shifting the contacts to compensate for the phase displacement of the current. A more or less proper operation may thus be ensured as long as no variations occur in the power factor. Owing to the use of a coil through which the current itself is caused to flow and which acts on the mercury jet, an automatic shifting may be produced which will ensure the cut off when the current passes through its minimum value, irrespective of the value of the power factor.

These governing coils may be provided with a core made of magnetic material and may be arranged in the best way in accordance with the result to be obtained. In principle the length of the path of the mercury jet under the energising pole is selected so that the time of run is at least equal to the duration of half a period or of an entire number of half periods, in order to avoid too much a variation of the deflection. It is however to be understood that in accordance with the usual practice in the electrical construction, the governing magnetic system may be provided with one or more short circuited turns surrounding the whole or a part of the magnetic core for stabilising the deflection.

Such precautions are especially required when use is made for the welding operation of a non synchronised starting device, the moment the energising current being set up not being predetermined. For various controls several contacts, used together or by part, may be provided and segments arranged in succession or concentrically may also be provided.

In the annexed drawings:  
Figs. 1 and 2 illustrate in sectional central elevation view and plan view, respectively, a simplified showing of a rotating mercury jet switch or commutator;  
Figs. 3 to 6 are detail views of the apparatus.  
Fig. 7 is a diagram of the electric connections.

Referring to the drawings, in Figs. 1 and 2, the parts of the apparatus of the kind referred to which are of usual construction and which are without influence on the desired result as soon as they are constructed according to the rules of the art, have been omitted or simplified in order to simplify the description.

The synchronous motor 1 actuates the toothed pinion 2 driving a toothed wheel 3 generally made of greater sizes. The toothed wheel 3 actuates a shaft 4 rotating in a bearing 5.

The toothed wheel 3 may be made of insulating material and the bearing 5 may be insulated from the supporting frame, or an insulating coupling may be inserted in the shaft 4 past the bearing 5. In any case the construction is to be made such that this shaft may be placed under electric tension.

sion without introducing difficulties or hindrance in the use of the apparatus.

The insulating arrangement may be made in numerous ways without exceeding the spirit of the invention.

The shaft 4 is provided with a small closed bell 6 extending in a tubular sheath 7 forming part of the casing 8 enclosing the active portion of the switch or commutator. This casing 8 forms a bucket at 9. This bucket and the sheath 7 are full of mercury and the bell 6 dipping in the mercury forms the hermetic seal which enables a properly selected atmosphere to be maintained in the casing. The casing 8 which is made of circular cross section includes a sloping part 10, a vertical part 11 and a flange 12 providing for a sealing joint.

The casing 8 as well as the other parts liable to contact with the mercury are made of steel or any other metal and carefully chromed to avoid any possible attack. The parts 9, 10 and 11 of the casing 8 may receive any particular shape, grooves or serrations, wings or extensions deemed useful to increase the contact surface with the mercury in order, on the one hand to ensure the cooling of said mercury, and on the other hand to increase the contact surface with the external air and to ensure the cooling of the whole structure.

According to the value of the current flowing through the apparatus, any useful means may be used to ensure the cooling, and particularly either a ventilator may be arranged under the casing 8 or this casing may be provided with a double wall enabling same to be surrounded entirely or by part with an oil bath cooled by means of a water cooling coil.

The casing 8 which supports an important part of the apparatus, is to be mounted on any suitable support ensuring an appropriate insulation of the casing which remains normally under current, while permitting the casing to be rotated about the shaft 4 a sufficient quantity to secure synchronism.

The bell 6 is externally provided with blades rotating in the bucket 9 full of mercury and tends to cause the mercury to rise in the conduit 13 made integral with the bell 6. From the conduit 13 the mercury is carried to the tube 14 shaped to form one or more coils 15 to which may be associated a core 16 made of magnetic material.

The jet or mercury escapes from the nozzle 17 and passes between the two pole pieces of the core 16. The magnetic core 16 also carries a coil 18, the entrance and outlet of which are connected to two rings 19 and 23, respectively, in engagement with brushes 21 and 22 which are connected to two terminals 23 and 24. These two rings are mounted in an insulated manner on an extension of the conduit 13 which rotates together with the latter. The brushes 21 and 22 as well as the terminals 23 and 24 are carried by a part 25 forming a cover for the casing 8. According to the sizes of the apparatus, which sizes are naturally variable with the value of the current and the speed of rotation, this part 25 is made of insulating material or of a piece of metal provided with a suitable number of insulating portions. The part 25 rests on the flange 12 of the casing 8 through the intermediary of a packing, and the packing is tightened by means of screws, bolts or springs.

Besides from the terminals already indicated,

the part 25 carries various segments 26 insulated from another and connected with blades.

These segments may be placed on the same circumference or they may be arranged in a concentric manner as indicated Fig. 2.

The number and length of these segments will depend on the number and duration of the operations to be performed with the switch or commutator.

When a segment is to be used for the setting up and cutting off a great intensity liable of phase displacement relatively to the tension, there is provided a coil generating a correction field for the angle of displacement as hereinbefore indicated.

This coil may be carried by the mercury jet forming pipe, as the coil 15, but arranged in a different plane. This coil may also be secured past the segment, as illustrated at the end of the segment 26 in Fig. 2.

The segment 26 is connected to the exterior by means of a terminal 27 and the intermediary of a coil arranged around a core 29. This core is disposed slightly in front of the segment 26 and at this place it is provided with an air gap 30 located at just the proper height for permitting the mercury jet to pass through. The external faces of the coil and of the core are naturally suitably insulated.

At places where heavy sparks are liable to occur in case of bad adjustment, strong and infusible insulators, such as quartz, indicated at 31, are disposed along the length of the wall or of the bottom of the casing 8.

A pipe 32 ending in the vicinity of the mercury surface enables the casing to be filled with an appropriate gas. A pipe 33 provided with a sieve 34, a cock 35 and a burner-like outlet 36, enables the gas to be ignited when a combustible gas is used while such an arrangement prevents the flame to propagate, in case of a premature lighting of said gas.

Observation holes 37 made of transparent material may be arranged on the cover 25 to enable the operation to be controlled.

The diagram of Fig. 7 illustrates the operation in the simple case of a spot welding machine operating at the flight. This example has been selected to show one of the applications only and does not limit in any way the use of the device.

In this case the switch comprises three segments 38—40—41. The mercury jet is such that it does not impinge on any one of said segments but passes below them.

The segment 38 extends almost the entire length of the circumference and is provided at its inlet end, in the direction of rotation of the jet with a small extension 39 extending enough in downward direction to meet the mercury jet.

One of the mains 42 of the supply line is connected through the starting contact 43 and through the intermediary of the resistance 45 to the terminal 24 of the coil 18, while the terminal 23 is connected to the other main 44 of the supply line.

When the contact 43 is closed, the coil 18 is energized. The mercury casing 8 is connected to the main 42 and the segment 38 is connected to the terminal 24. When the mercury jet meets the part 39, the current will pass through the mercury jet, and the latter will be deflected by the field generated in the coil 18. Thereupon the mercury jet will raise and impinge the segment 38. From this moment, the welding cycle may continue even when the button 43 is released.

After a certain angle displacement the mercury jet meets the segment 40 which is for example connected to the coil of an electro-valve 46, the other end of this coil being connected to the main 44, so that the electro-valve is supplied. 5 After a predetermined time, the mercury jet meets the segment 41 which is connected to the primary winding 47 of the transformer 48 of a welding machine. However, this segment 41 is connected, through the intermediary of the coil 10 28 aforesaid, which will deflect back the mercury jet at the moment of the cut off to concord with the phase displacement of the current. When the current is cut off, the mercury jet will cut off the electro-valve and then release the segment 38. 15

The cycle will be continued or repeated as long as the contact 43 remains closed.

This example of simple nature shows how easy it is with a switch or commutator of this kind to control the operating cycle of a welding machine. 20

Naturally a larger number of segments or several mercury jets may be used. Also several switches or commutators may be associated, and may be actuated by a single or several synchronous motors. 25

These switches or commutators may be arranged in the same casing or in separate casings.

To execute somewhat more complicated operating programs or to control somewhat powerful welding machines, it has been found more convenient to make use of either two mercury jets 30

or two commutators or switches, one of them, having a small output, ensuring the actuation of all the auxiliary apparatus, and the other, which is controlled by the former, and having a considerable output, cutting in and out the welding current.

When these commutators or switches have to deal with a small intensity only, they may be simplified, and in such a case they require a mercury jet of very small diameter and a very small power only. They may play the role of quick acting and synchronised relays.

The rotating mercury jet commutators or switches permit the actuation and control of welding machines or resistance welding machines as spot, butt or end, or continuous welding machines and either directly supplied in alternating current or operated with self or capacity accumulation.

The small power required to deflect the mercury jet enables to a certain extent the use of such commutators or switches as amplifying relays.

It is to be understood that without exceeding the limits of the invention, such modifications may be made in the usual designs of the commutators or switches of this kind, as are required by the value of the intensity to be cut out or of the duration of the cycle. In certain cases a separate mercury pump may be required rotating at a greater speed than that of the distributing shaft.

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RESISTANCE ELECTRIC WELDING MACHINES

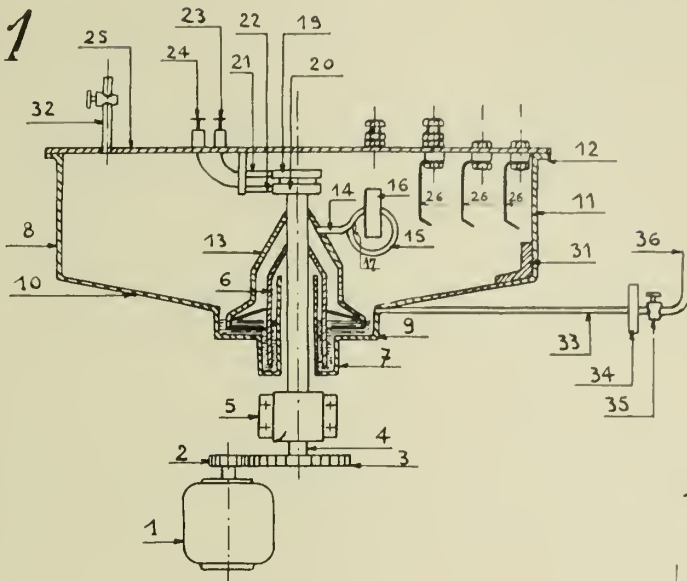
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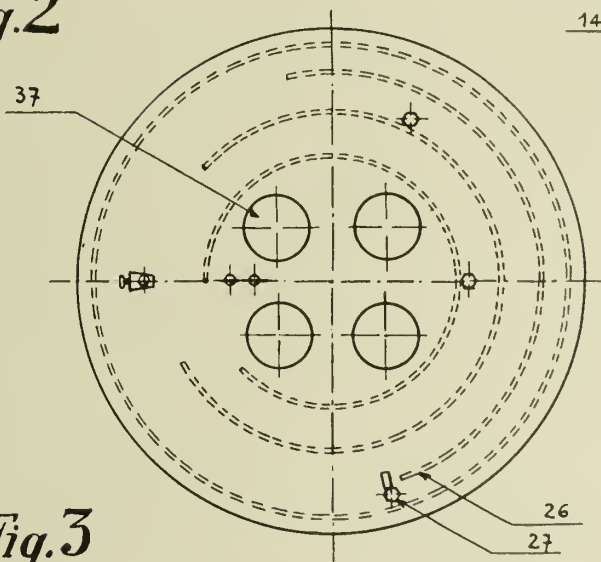
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*Fig. 1*

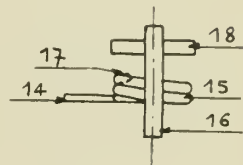
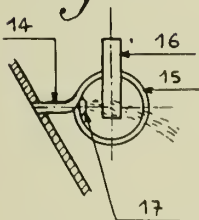


*Fig. 4*

*Fig. 2*



*Fig. 3*



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MAY 18, 1943.

BY A. P. C.

J. E. J. LANGUEPIN

RESISTANCE ELECTRIC WELDING MACHINES

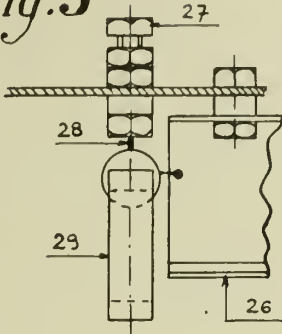
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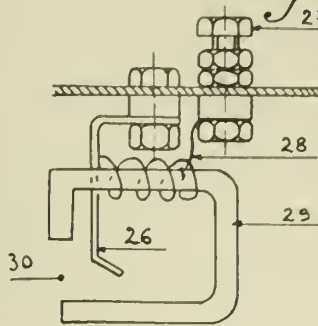
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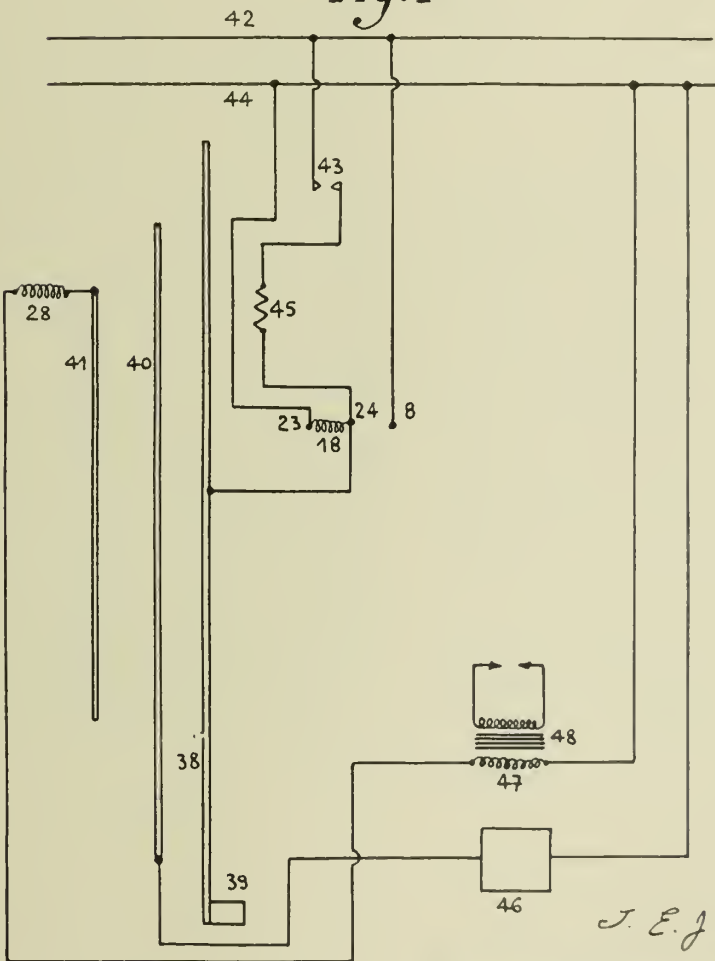
*Fig. 5*



*Fig. 6*



*Fig. 7*



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# ALIEN PROPERTY CUSTODIAN

## ELECTRICAL MACHINE

Ottmar Conradty, Rothenbach on the Pegnitz,  
and Hans Zöllner, Lauf on the Pegnitz, Ger-  
many; vested in the Alien Property Custodian

Application filed May 8, 1940

This invention relates to electrical machines and has particular reference to the adjustment of the resistance conditions of such machines.

So far, collectors of electrical machines have been made exclusively of metal, preferably copper. The specific resistance of copper is a constant. Therefore, the resistance of the commutator bars or segments had a predetermined value and, in order to adjust the resistance conditions of the circuit formed by the short-circuited coils, special steps had to be taken. For example, the windings had to be changed or separate resistance elements had to be inserted.

It is an object of our present invention to avoid these difficulties by the provision of collector bars or segments the resistance of which is adjusted to meet the resistance conditions of the machine circuit.

With this and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which:—

Fig. 1 is a schematic view of the stationary parts of a known machine circuit including separate resistance elements.

Fig. 2 is a similar view but showing a circuit having the invention applied thereto.

Referring now to the drawings in greater detail, it will be seen that in Fig. 1, the resistance of the stationary parts of the machine circuit is composed of the resistance A of the field coils, the resistance B of the collector bars which is a predetermined value depending on the constant specific resistance of the metal of the collector

bars, and the resistance C of separate resistance elements which are inserted in the circuit merely for the sake of an adjustment of the total resistance  $A+B+C$  which in order to ensure favourable commutating conditions and for other reasons must have a predetermined amount.

Now, in order to avoid the provisions of such additional resistance elements C, we use special commutator segments D, Fig. 2, the resistance of which is so adjusted, by the choice of a material of suitable ohmic resistance, that it represents the amount  $B+C$  of the arrangement according to Fig. 1. Thus a total resistance  $A+D=A+B+C$  is attained without any additional resistance elements C, which, on the contrary, are "incorporated," so to speak, in the commutator bars themselves, as indicated in Fig. 2 in dotted lines.

In the practice of our invention, we prefer the use of commutator bars of artificial or synthetic carbon material the specific resistance of which can be varied within wide limits in the manufacture. It is thus possible, by variation of the artificial resin material of the commutator bars, to vary the resistance of the coil circuit.

In this manner, we may also standardise the windings of different machines within certain limits. Thus, by standardisation of the construction considerable economical advantages and by improvement of the commutation, great technical advantages are achieved.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

OTTMAR CONRADTY.  
HANS ZÖLLNER.



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MAY 18, 1943.

BY A. P. C.

O. CONRADTY ET AL

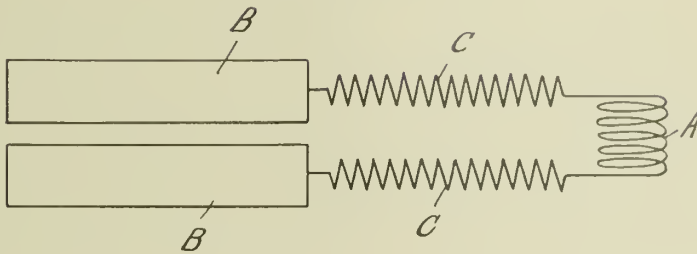
ELECTRICAL MACHINE

Filed May 8, 1940

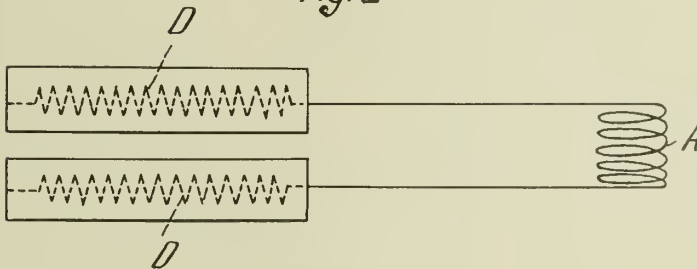
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*Fig. 1*



*Fig. 2*



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*By* *Young, Egan & Thompson*  
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# ALIEN PROPERTY CUSTODIAN

## CARBON COLLECTORS

Hans Zöllner, Lauf on the Pegnitz, and Ottmar Conradty, Rothenbach on the Pegnitz, Germany; vested in the Alien Property Custodian

Application filed May 8, 1940

This invention relates to a collector or commutator system the segments or bars of which consist of artificial carbon material.

It is an object of the present invention to provide a collector system, having a plurality of brushes arranged at different axial distances from the terminals of said segments, which while preserving the inherent advantages of carbon segments, avoids the drawbacks so far existing where the brushes were arranged at different distances from the connecting points of the segments.

With this and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which—

Fig. 1 is a fragmentary side view of a collector having the invention applied thereto.

Fig. 2 is a similar view, showing a modification.

Fig. 3 is a perspective view of one segment of the collectors shown in Figs. 1 and 2.

In collectors of electric machines, at least one brush is provided for each pole, but in case of medium, larger and very large output machines there are usually several brushes arranged side by side in an axial direction of the collector and connected in parallel. The space between the brushes results from the size of the brushes, the construction of the brush holder and the available collector length. Hence, each brush of the row of brushes on one brush pin has a different distance from the conductor between the coil winding and the segment. This is indicated in Fig. 1 by the distances  $a_1$ ,  $a_2$ , and  $a_3$  from the brushes  $b_1$ ,  $b_2$  and  $b_3$  to the points  $d$  where the cables or wire ends of the coil windings are connected to the segments  $f$ .

But even where the collector has one brush only in contact with each segment, i. e., one brush per pole, the brushes in many instances are not arranged in one plane normal to the axis of the collector but they may be staggered in an axial direction. This staggered arrangement is also sometimes used where a plurality of brushes are associated to each pole and brush holder, such arrangement being indicated by the various distances  $a_1'$ ,  $a_1''$ ,  $a_1'''$ ,  $a_2'$ ,  $a_2''$ ,  $a_2'''$  between the

brushes  $b_1'$ ,  $b_1''$ ,  $b_1'''$ ,  $b_2'$ ,  $b_2''$ ,  $b_2'''$  and the connecting points  $d$ , Fig. 2.

In the conventional commutators having copper bars or segments these differences do not affect the operation of the commutator, since the electric resistance of the copper bars is very small and, consequently, the resistance of the lengths  $a_1$ ,  $a_2$ ,  $a_3$  has no noticeable effect upon the total resistance. Therefore, the brushes are substantially symmetrically loaded.

It will be appreciated, however, that in carbon collectors, owing to the considerably higher electric resistance of the carbon segments, which of course has normally a favourable effect upon the commutation, the high resistance of the segments causes a non-uniform distribution of the current passing through the various brushes. The current is distributed over the parallelly connected brushes  $b_1$ ,  $b_2$ ,  $b_3$  proportional to the different resistances  $a_1$ ,  $a_2$ ,  $a_3$  since the resistances of the brushes  $b_1$ ,  $b_2$ ,  $b_3$  are substantially equal and it would not be practicably possible to use brushes of different specific resistances or cross sections to compensate this unbalance. As a result of this unbalance the brush  $b_1$ , Fig. 1 which is next to the connection  $d$  carries the maximum current load, while the shares of current passing through the brushes  $b_2$  and  $b_3$ , Fig. 1, are correspondingly reduced. This results in a very bad commutation and overloading of brush  $b_1$  and finally the brush  $b_1$  will become inoperative. Now, the same phenomenon occurs with respect to the brush  $b_2$ , etc. and in fact, the whole set of brushes would be gradually destroyed owing to the said unbalance.

Now, to remove this difficulty, I provide a conductor of substantially higher electric conductivity than that of said carbon material to extend lengthwise of each segment and to be in electric contact therewith, in such a manner that the electric resistance through the segment is substantially the same from any point of its outer surface to the connecting point  $d$ .

In the practice of my invention, I provide a metal strip  $g$ , Fig. 3, under the base of each segment  $f$ , and I connect the coil ends at  $d$  to said metal strip, whereby the path of the current through the carbon segment is limited to the lengths  $c_1$ ,  $c_2$ ,  $c_3$ , which, of course are equal and do not cause any unbalance. As a result, perfect balance is ensured and the brushes are exposed to uniform loads of electric current transferred to, or fed by, the same.

It will be appreciated that the same effect is obtained in collector systems with staggered

brushes according to Fig. 2, irrespective whether one brush  $b_1$  or a plurality of brushes  $b_1, b_2 \dots$  are simultaneously in contact with one segment.

It is contemplated within the purview of this invention that the strip  $g$  may be a separate 5 smooth strip of metal secured to the base or innermost face of the segment or that a metal deposit may be applied on said face, for example, by a galvanic, metal spraying or casting operation. Also, flexible metal foils or textures may 10 be provided to this end between the insulation and the base of the carbon segment. It is also possible to provide a recess or base in the carbon segment, as indicated at  $h$  in Fig. 3, and a metal

bar or rod may be forced or cast into said recess or the carbon material may be pressed around the metal insertion.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

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BY A. P. C.

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CARBON COLLECTORS  
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Fig 1

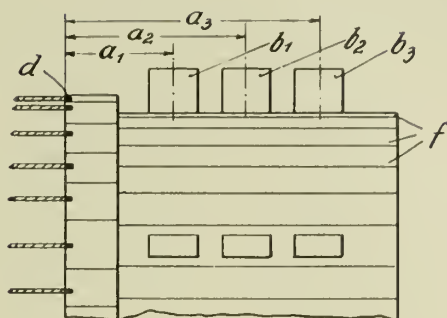


Fig 2

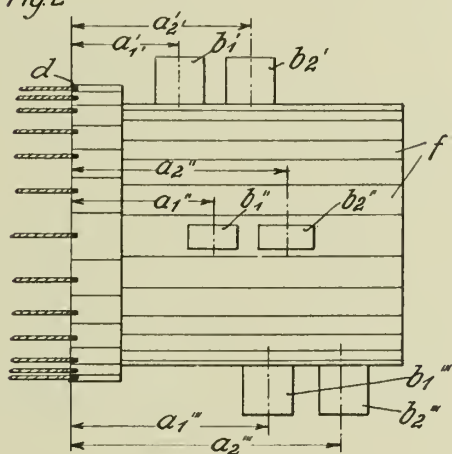
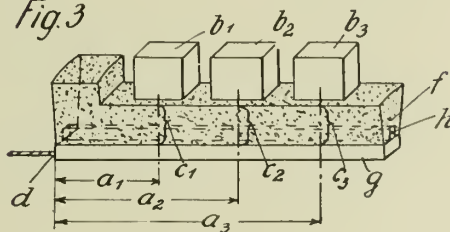


Fig 3



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By Young, Egan & Thompson  
Attorneys



# ALIEN PROPERTY CUSTODIAN

## APPARATUS FOR SEPARATING SOLID MATERIALS HAVING DIFFERENT SPECIFIC GRAVITIES BY MEANS OF A SUSPENSION

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Application filed May 14, 1940

This invention relates to an improvement in the apparatus disclosed by my prior United States Patent 2,139,047, i. e. in apparatus for separating solid materials having different specific gravities by means of a suspension of "sand" in "water." This apparatus comprises a tank containing a body of a suspension of sand in water having a downwardly increasing density, said tank being further provided, in addition to means for creating substantially horizontal currents in the suspension at different distances above the bottom, with means for removing suspension from different levels in the tank, means for removing the floating products, and one or more means for removing products transported by the currents towards the side wall at an intermediate level in the tank.

More especially my invention relates to the aforesaid means for removing products transported by the currents towards the side wall at an intermediate level in the tank. In accordance with my aforesaid prior patent, these means comprise one or more drag conveyors movable across side wall openings, through which suspension is adapted to be discharged from different levels in the tank. In practice it has been found that this construction is not entirely satisfactory, owing, inter alia, to the fact that a movable drag conveyor disturbs the parallel flow of the suspension and sets up eddies therein, whereby the suspended products are difficult to be caught. Moreover, the separation of these products from the suspension requires the use of a drag conveyor composed of perforated plate-links, or the provision of strainers in the discharge openings, and this has the inconvenience that said perforations or strainers are liable to be obstructed, whereby the horizontal flow of the suspension is braked.

This braking effect will increase as the amount of middlings increases, although just under these circumstances it is essential for the horizontal flow to be relatively strong in order that excessive concentration of middlings in the bath may be avoided.

The object of my present invention is to do away with the use of strainers, sieves or the like, so as to ensure an unimpeded transport of the middlings through the bath and thus to better adapt the apparatus to the separation of relatively fine materials, i. e. of materials that are very liable to clog the meshes of sieves or the like.

With this and other objects in view, my invention consists in the dispensation with of the me-

chanical means for removing middlings from the bath, and by the provision, beyond the submerged portion of the mechanical means for removing floating products, of a weir for discharging substantially the whole amount of fluid flowing along substantially horizontal paths through the tank, together with the middlings suspended therein. It will be understood that with this construction the middlings will be discharged by hydraulic means, i. e. by an upwardly directed current of fluid in the vicinity of the weir.

The hydraulic discharge of the middlings transported towards the side wall of the tank requires a predetermined minimum velocity of flow of the suspension near the weir. If this velocity exceeds the desired relatively low horizontal velocity of the currents created in the main portion of the tank, the end portion of the tank may taper in the direction of flow. Alternately, or additionally, part of the suspension discharged by the weir may be returned directly to said end portion, instead of to the suspension inlet openings of the tank as described in our prior specification.

Other features of my invention will appear from the following description and be set forth in the appended claims.

The annexed drawing shows, by way of example, two embodiments of the invention.

Fig. 1 is a vertical longitudinal section of the first embodiment, and

Fig. 1a is a top plan view thereof with the drag conveyor for the floating products broken away.

Figs. 2 and 2a are corresponding views of the second embodiment.

In Figs. 1 and 1a, the tank 3 has tapering front and rear walls, and vertical left and right hand side walls 4 and 5, respectively. Mounted in the lower portion of the tank is a horizontal drag conveyor 6 driven in clockwise direction and having its delivery end located vertically above an inclined chute 7. A second drag conveyor 8 driven in anti-clockwise direction, is mounted with a portion of its lower part parallel with the surface 9 of the body of suspension within the tank 3, a further portion of said part being parallel with an inclined dewatering screen 8a, the lower end of which extends downwardly to say 4-6" below the level 9. The delivery end of conveyor 8 is located vertically above an inclined chute 10 connected to said screen.

The left hand side wall 4 is provided with two vertically spaced suspension inlet openings 11, 11a.

As distinguished from the apparatus disclosed by my prior Patent 2,139,047, the right hand side wall 5 of tank 3 is not provided with vertically spaced suspension outlet openings, and neither is there provided a drag conveyor for removing from the bath the middlings transported, by the suspension supplied through openings 11, 11a, from left to right towards said side wall intermediate the surface 9 of the bath and the drag conveyor 6. Instead, the right hand side portion 12 of the tank located above the conveyor 6 tapers in the direction of flow of the suspension as indicated by arrows in Fig. 1, and merges into a relatively narrow, parallel-walled end portion 13, whose right hand side bottom corner is suitably rounded off as shown. The top edge of wall 5 is located substantially at, or somewhat below the level of the lower edge of dewatering screen 8a and forms a weir 5a.

Secured to the outer face of wall 5 is a dewatering screen 14, and mounted below said screen is a boot 15. The lower end of boot 15 is connected, through a conduit 16, with the suction side of a pump 17, the delivery side of which communicates, through a conduit 18, with a thickener 19. The lower end of the thickener is connected with a distributing pipe 20, and its overflow pipe 21 discharges into a hopper 22, the lower end of which is connected to a distributing pipe 23. Said distributing pipes are adapted to discharge into conduits communicating with the inlet openings 11a and 11, respectively.

The modus operandi of the described apparatus, as far as the gravimetric separation of the material treated therein is concerned, is not essentially different from that of the apparatus disclosed by my aforesaid prior patent. That is to say, assuming run-of-mine coal to be charged into the tank as at A, and the drag conveyors 6 and 8 to be suitably driven, the pure coal will float, be carried by the lower part of conveyor 8 towards the dewatering screen 8a, and raked over this screen so as to be lifted out of the bath, whereupon it slides down over the chute 10 to be further conveyed by means not shown.

The slate sinks to the bottom, from which it is removed by the conveyor 6.

The middlings, for instance bony coal, will sink below the surface 9 of the bath and remain suspended at a greater or smaller depth below the level of the submerged left hand side portion of screen 8a, since the suspension in the tank has a density increasing from top to bottom owing to the slow settling of the "sand." The substantially horizontal currents created by the suspension fed into the tank through the inlet openings 11 carry the suspended middlings towards the right, i. e. towards the portion 13, in which the fluid is compelled to flow upwards. The middlings are forced to follow this movement so as to be discharged, together with the suspension, by the weir 5a, provided that the suspension in said portion has the required vertical velocity. As will be understood, the taper of the right hand side portion 12 of tank 3 has the effect of increasing the velocity of the suspension flowing towards the portion 13 so as to ensure the desired hydraulic discharge of the middlings in upward direction through said portion, which thus actually functions as an uptake.

The middlings thus discharged are further

conveyed by means not shown, and the suspension is collected in boot 15, whence it is fed, by pump 17, to the thickener 19. In this thickener, the "sand" is allowed to settle to a certain extent, so that a relatively light suspension overflows into hopper 22 to be supplied to the tank through the distributing pipe 23 and the upper feed opening 11, and a relatively heavy suspension is discharged into the distributing pipe 20, whence at least part thereof returns to the tank through the lower feed opening 11a.

Figs. 2 and 2a show an apparatus, which, as far as the parts designated by the references 3 to inclusive 12 are concerned, does not essentially differ from the one illustrated in Figs. 1 and 1a. As to the narrow, parallel-walled right hand side end portion 13 of the tank, however, this has mounted therein two vertical, transverse partitions 24 and 25 suitably spaced in the direction of flow so as to divide portion 13 into three compartments 26, 27, 28. The lower edges of these partitions are located at different levels intermediate the level of the lower, submerged edge of screen 8a, and the conveyor 6. The partition 25 nearest to the side wall 5 extends to a greater depth than partition 24. Said partitions are provided, along their lower edges, with more or less horizontal extensions 24a, 25a, respectively, pointing to the left.

The rear wall of the portion 13 of the tank is of reduced height so as to form a stepped weir 29 for the discharge of suspension and middlings from compartments 26, 27 and 28, respectively into chutes 30, 31 and 32, respectively. As will be observed, the stepped weir extends on either side of partition 25 as also of partition 24.

As diagrammatically shown, partition 25 is adapted for vertical adjustment. Partition 24 may be mounted in a similar manner.

Obviously, in the apparatus just described suspensions and middlings of increasing specific gravities will be hydraulically discharged, through compartments 26, 27 and 28, respectively, by the weir 29, which delivers them to the chutes 30, 31 and 32, respectively. The suspensions are drained off and the middlings washed by means not shown. Said suspensions as well as the suspensions recuperated from the washing water may be collected and returned to the inlet openings 11, 11a, 11b, 11c of the tank in the manner described in our prior specification. If desired, part of said suspensions may be returned directly to the lower portions of said compartments so as to still further increase the vertical velocity of flow therein. This has the advantage that with a predetermined low velocity of the substantially horizontal currents created in the main part of the tank any desired vertical velocity of flow in the uptakes 26, 27 and 28 can be obtained.

Figs. 2 and 2a show an apparatus with three uptakes 26, 27, 28, but it will be understood that if necessary the middlings may still further be graded by providing the right hand side portion 13 of the tank with three or more suitably spaced partitions, the lower edges of which extend downwardly to depths increasing in the direction of flow of the suspension. In other cases, only one partition will suffice.

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PUBLISHED

MAY 18, 1943.

BY A. P. C.

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HAVING DIFFERENT SPECIFIC GRAVITIES  
BY MEANS OF A SUSPENSION  
Filed May 14, 1940

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2 Sheets-Sheet 1

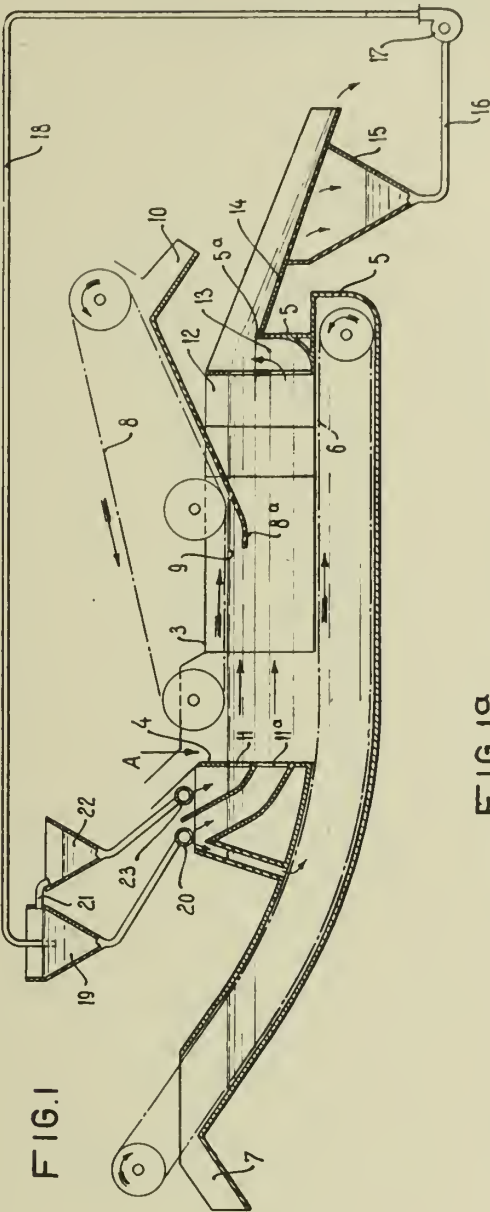
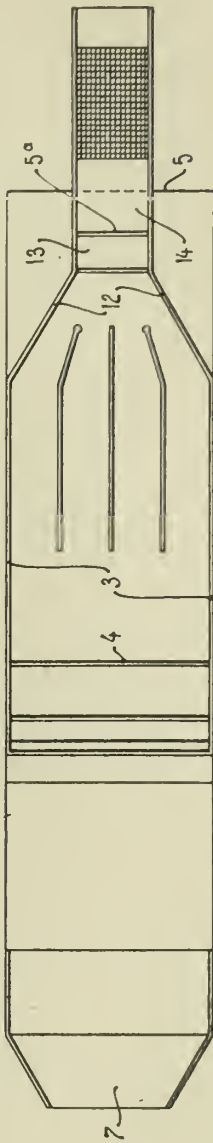


FIG. 1

FIG. 1a



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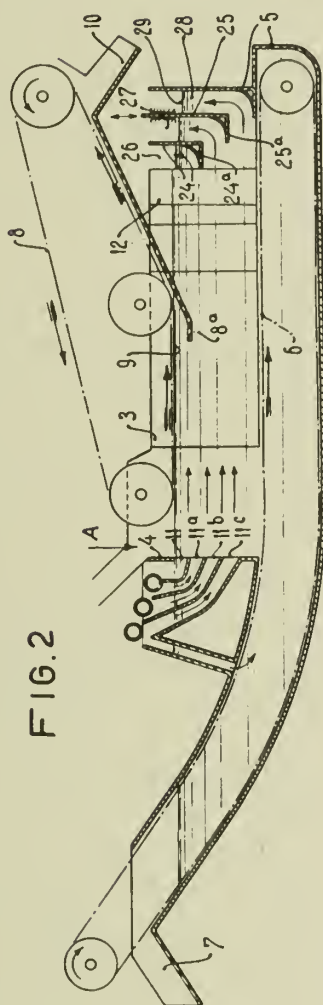


FIG. 2

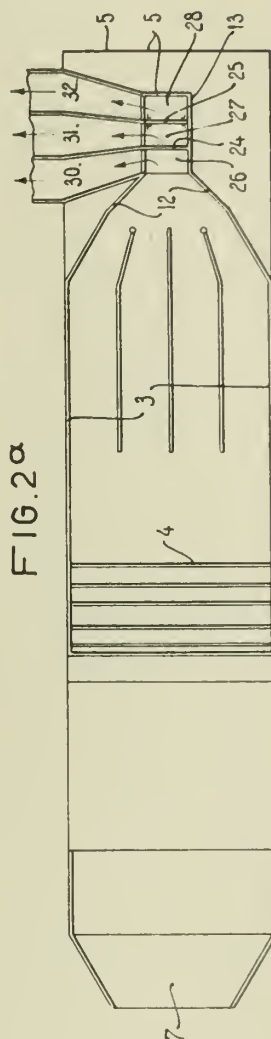


FIG. 2a

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# ALIEN PROPERTY CUSTODIAN

## PROCESS AND MEANS FOR THE CONSTRUCTION OF HOUSES WITH STANDARD PANELING

Raymond Béhin, Gennevilliers, France; vested in the Alien Property Custodian

Application filed May 15, 1940

The present invention covers a process and means for the construction of houses with standard panels, namely, sheet metal elements.

The construction of a sheet metal house cannot be executed in a practical manner except when carried out with standard parts produced in large quantities and fabricated with extreme care.

In a general way, the invention consists of a structural steel base provided with projected dowels for centering, their spacing being absolutely true. On this chain-bond and between the centered dowels the standard parts are to be erected, appropriate spacings being interposed between the parts.

To carry out this process, the invention consists of the following operations:

1. Laying the base forming part of the chain-bond.
2. Erecting the closets thereby constituting supporting points.
3. Erecting an exterior panel.
4. The whole is held together by the placing of a ceiling panel, which is fitted in by a tight joint acting like a box cover.
5. The whole thus constituted stays in place before the final tightening of a few bolts with hand operated nuts.

The invention covers the means for carrying out the process and mainly covers the following points applied separately or in a number of combinations:

(a) Closets or metal columns are provided to establish the supporting points and mainly in the central portion of the house.

(b) The standard parts are composed of metal panels the edges or ends of which are beaten down at a 90° angle, the marginal parts of these extremities are themselves beaten down so that the section takes the form of a U.

(c) The edges are provided with a groove which at the lower extremity are fitted to the dowel which determines the centering specially for the vertical partitions and which permits the fitting of a joint or an electric feeder or other.

(d) The standard panels provide, for the vertical partitions and the ceilings, an isothermic lining.

(e) The standard panels offer to the floors a concrete fill, or other similar, binding means for the concrete, the latter being previously attached to these panels.

(f) The standard panels are set each to the other in a manner similar to the tongue and groove used in parquet floors.

(g) The material ensuring the jointing also serves as a water-tight joint as well as an expansion joint.

(h) The grooves provided on the beaten down edges or ends of panels permit mainly: the fitting of a joint cover, the adaptation of rubber joints, the establishment of a raising and lowering method on a ball bearing course for the sliding panels, to provide accommodations for electric conduits, or other.

(i) A few of the vertical panels, externally located, are provided with stanchions for the setting of string-courses.

(j) The jointing of the different elements between themselves is done by bolts and earnuts or by regular bolts and streaked nuts.

(k) The assembling of the panels or the roof plates is made by the use of a split tubing slid over the adjacently raised ends of these panels in a manner as to ensure a tight bind and without screws.

The invention equally covers a house constructed according to it which offers a central corridor flanked on each side by closets constituting supporting points, the floor, the walls and the ceiling being erected by the aid of the standard elements whereas the roof is composed by plates inclined toward the closets.

The invention furthermore covers other special points which are mentioned in the following text making reference to the attached drawing, given only as an example, in which:

Figure 1 is a perspective of a channel iron forming the chain-bond base of the house.

Figure 2 is a plan with a horizontal section showing the erection of the standard elements, constituting the vertical panels.

Figure 3 is a part view corresponding to the preceding figure but at a larger scale.

Figure 4 is a sketch plan of a house carried out according to the invention.

Figure 5 is an elevation, in transverse section, of the house represented by the preceding figure.

Figure 6 is a section showing the putting together of standard elements constituting vertical panels.

Figure 7 is a section showing the setting up of vertical panels perpendicular to each other.

Figure 8 is a sectional elevation showing the joining between the standard elements constituting the ceiling panels.

Figure 9 is a sectional elevation showing the joining of the standard elements constituting the floor.

Figure 10 is a part elevation in transversal sec-

tion of a house carried out according to the invention.

Figure 11 is a large scale view detailing the portion indicated in "A" on the preceding figure.

Figure 12 is a large scale view detailing the portion indicated in "B" on Figure 10.

Figure 13 is a rough sketch of the exterior vertical panels.

Figure 14 is a corresponding plan.

Figure 15 is a side elevation of these panels and of the setting-up of the string-course and of the roof.

Figure 16 illustrates in section the assembling of the roof panels.

Figure 17 is an elevation showing the setting of a window.

Figure 18 is a section made along the line XVIII—XVIII of the preceding figure.

Figure 19 is a larger scale section made along the line XIX—XIX of Figure 17.

Figure 20 is an elevation showing the setting up of a door.

Figure 21 is a section made along the line XXI—XXI of the preceding figure.

Figure 22 is a large scale section made along the line XXII—XXII of Figure 20.

The metallic structure forming the base is composed of shapes 1 (Fig. 1) preferably channels, set on a masonry foundation or other.

These shapes 1 have projections 2 which represent cylindrical dowels equidistant D corresponding to the width of the standard panels 3. These panels, as especially shown on Figure 2, are, each one, composed of a sheet metal 3 interiorly provided with an isothermic layer 2<sup>a</sup> of appropriate material. The edges of these panels are partly beaten down for rigidity and reinforcement 4. Each member 4 has a longitudinal groove 5 facing the longitudinal groove 5 of member 4 of the adjacent panel 3. All panels have the same shape; the reinforcing edges or ends 4 with groove or longitudinal rabbet 5. These rabbets generally offer accommodations for joints, as previously described. However, for the exact setting-up of the vertical panels, the lower part of each rabbet 5 stands securely on the corresponding dowel head 2 of the metallic structure in such manner that the setting in place of the panels should be quickly effected and with a great deal of precision. For the vertical partitions as shown on Figure 2, the panels are erected in pairs with a view of building-up a double partition provided with an air-space.

For the construction of a house, as particularly illustrated by Figures 4 and 5, there are erected metallic closets to begin with, which can eventually be replaced by metallic posts. These closets 8 constitute supporting points for the central portion of the house.

Between two pairs of vertical panels a special joint is used as shown on Figure 6. This joint which in section has the shape of a cross, is fixed on one end between the beaten down edges 4 and on the other end between the beaten down marginal parts 4<sup>a</sup> of these edges and ends. The joints also serve as a binder between the two neighbouring panels, as well as to absorb the eventual expansions.

These rubber joints 9 are internally reinforced by metal bands 10 and 11. The spaces 12 made available by the grooves 5 are utilised for the passage of electric wiring or other usages 14. These wires etc. are placed in some cases between the grips of spring steel pincers 15 which in section take the form of a T. These pincers

15 are forced in place as shown on Figure 6 and are thereafter pressed in position. These pincers 15 constitute at the same time a joint cover.

For the setting-up of a perpendicular partition 16, same is done as shown on Figure 7. To do this, a joint 17 is provided and the perpendicular partitions 16 are kept in place between the joint 17 and the offsets 18.

The ceiling is constructed, as shown on Figure 8, by the ordinary panels 3 between the beaten down edges in which are introduced joints provided with a tubular passage 20 for the electric wires or others. Two adjacent panels are connected by fasteners 22 set on the marginal beaten down parts 4<sup>a</sup> of the edges or ends 4. These fasteners 22 are held in place by the bolts 23 provided with earnuts 24 in order that the erection can be carried out without tools.

The floor is constructed as shown in detail on Figure 9. The metal linings 3 of the panels are not provided with an insulating material 3<sup>a</sup> but with a cement fill 3<sup>b</sup>, the panels 3 being provided with sheet metal anchors 3<sup>c</sup>, as shown. The slabs thus constituted are set in place by means of a joint 19 identical to the one used for the ceiling panels. In this joint 19 there is provided a passage 20 for the electric wires or others. The slabs are bound to each other by means of channels 27 previously fixed on the linings 3 of the panels and which are fastened by the bolts 23 and the earnuts 24. The slabs are thereafter covered by an appropriate floor material, as shown on Figure 9.

The facings 3 have their beaten down ends as shown on 4, not only on the two opposite sides, but also on the four sides in order to ensure a fitting with joint not only for the adjacent panels but also with the perpendicular panels. The connection of the vertical panels with the ceiling and the floor elements is particularly noted on Figures 11 and 12.

On Figure 11 the joints 19 are used with reinforcements 20. The connection between the upper part of the panels 3 with the ceiling elements or the roof structure, is done by the bolts 30 the heads of which are hookform and fastened to the beaten down marginal parts 4<sup>a</sup>, the earnuts 24 offering a hand operation without any tool.

The connection of the vertical partitions to element 1 of the structural steel floor is assured by the hooks 32 fitted on a metal strip 33 by means of bolts 23 provided with earnuts 24. This metal strip 33 has a shoulder 34, on which rest the floor elements and a vertical strip 35 for attaching the vertical panels. A rubber joint is provided at the point 36 between the vertical partition and the floor.

On the vertical partitions are fixed the uprights 37, as clearly shown on Figures 13, 14 and 15, and on which are attached, on one side string-course 38 and on the other side, the elements 39 of the roof.

The assembling of the roof panels 40 is made by the split tubes 41 as shown on Figure 16. These elements 40, the pitch of which is directed toward the central part of the house, end either directly (to the left on Figure 5) in the gutter for the evacuation of waters, or, by the intermediate panels to this gutter (to the right on Figure 5).

The windows are constructed, as clearly shown on Figures 17, 18 and 19, of sliding glass 45 set in sliding grooves 46 held in place between the parts 4<sup>a</sup> of panels 3 (Figure 19). This glass 45 is actu-

ated in its vertical course by a handle 46 and can be hidden in the lower compartment 47.

The doors 48 (Figures 20, 21 and 22) are hung and jointed at 49, the metal parts 50 carrying the lower elements of the articulations, rigidly fixed on the part 4<sup>a</sup> with a metal band 51 thereby constituting a support for a rubber band 52 or other.

The beaten down edges 4 of the panels can be reinforced, as shown on the various figures, by the internal steel shapes 53.

In a general way, it will be noticed that the various panels 3 with beaten down edges 4 and with the end parts 4<sup>a</sup> of these edges also beaten down, are identical for the building up of different partitions (wall, ceiling, floor). However these panels 3 possess, within the vertical partitions or the ceiling, an isothermic lining 3<sup>a</sup>, and for the floors a cement fill 3<sup>b</sup> or other.

Besides, the erection of the different panels, is carried out with great precision, due to the structural steel base and the placing of the panels in their right position, and is speedily done without any tool, due to the earnuts used. The pulling down of the house can also be done with great speed.

It is evident that the described methods also shown graphically, are only given as an indication and are not limited to it. All modifications or variables which do not at all change the main characteristics hereinabove stated nor the pursued aim, stay included within the framework of this invention.

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MAY 18, 1943.  
BY A. P. C.

R. BÉHIN  
PROCESS AND MEANS FOR THE CONSTRUCTION OF  
HOUSES WITH STANDARD PANELLING  
Filed May 15, 1940

Serial No.  
335,199

5 Sheets-Sheet 1

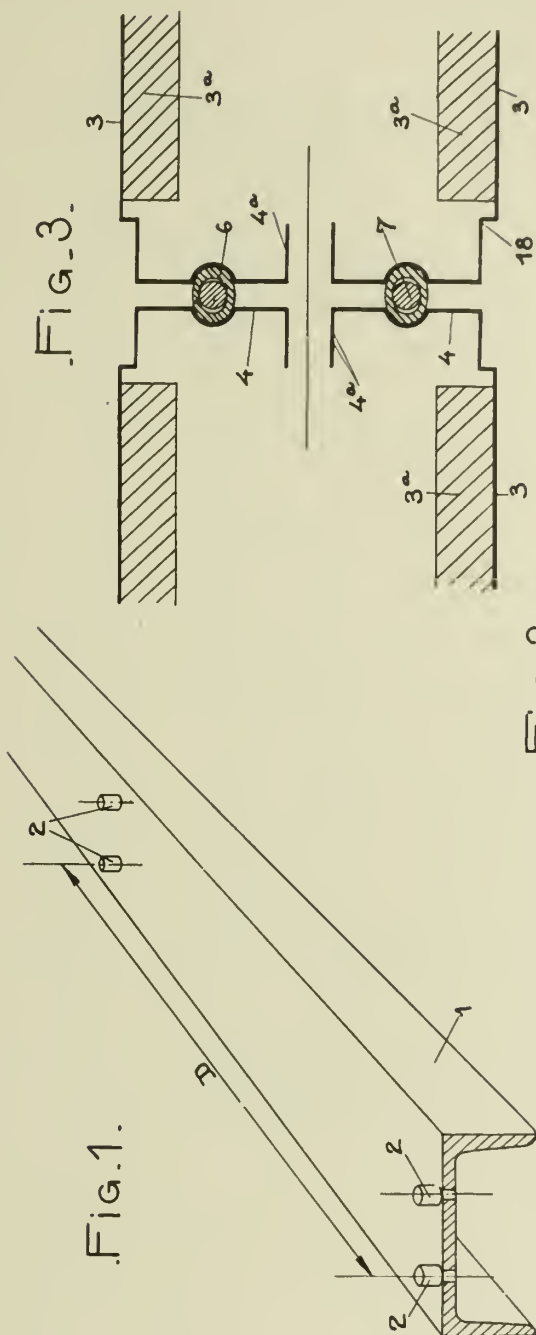


Fig. 3.

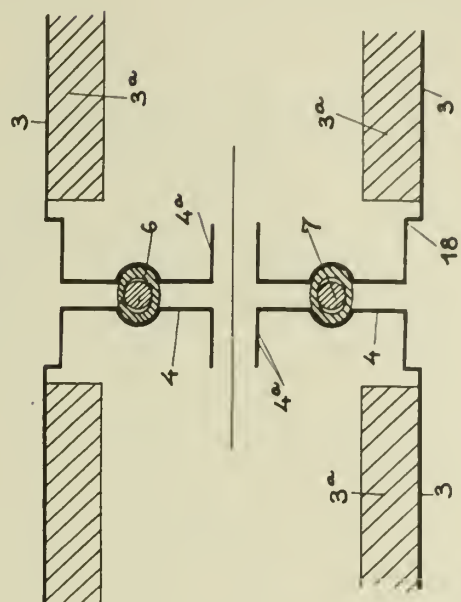
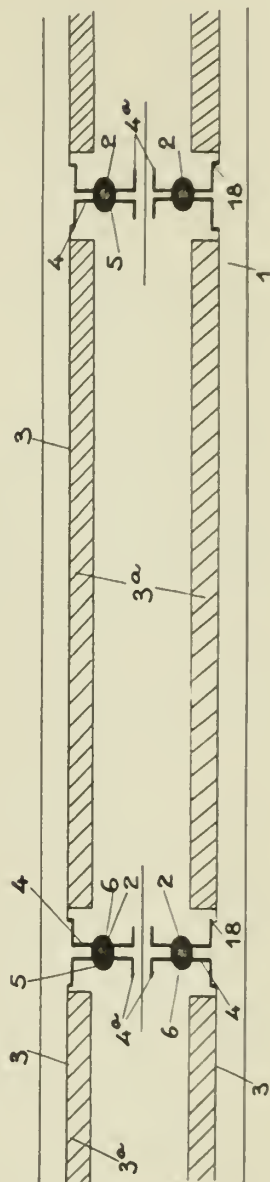


FIG. 2.



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335,199

5 Sheets-Sheet 2

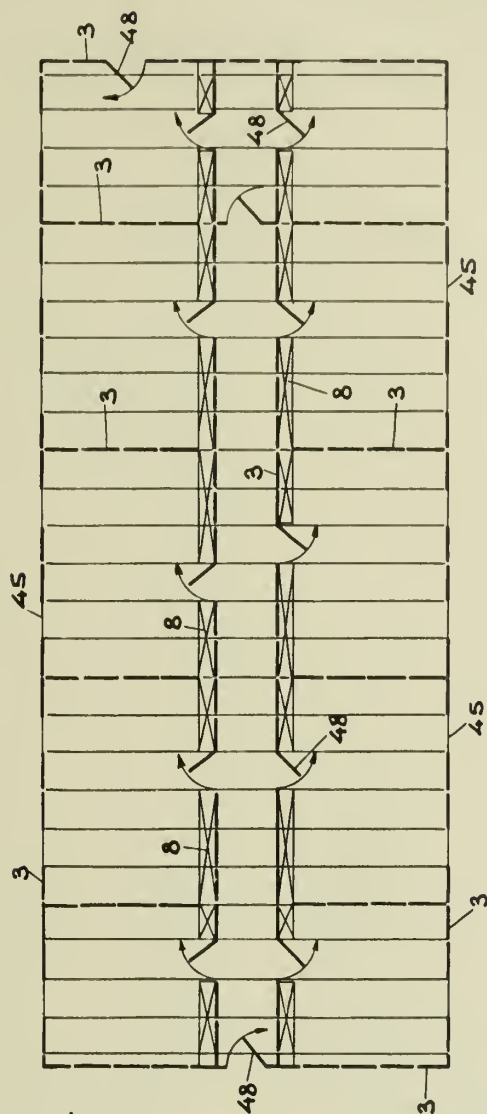
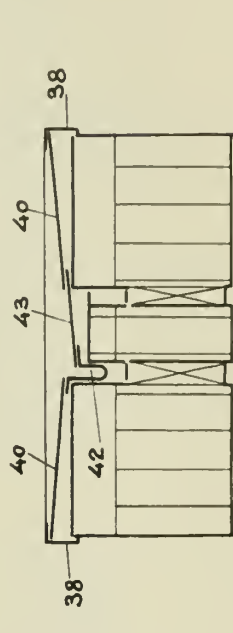


Fig. 4.

Fig. 5.



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5 Sheets-Sheet 3

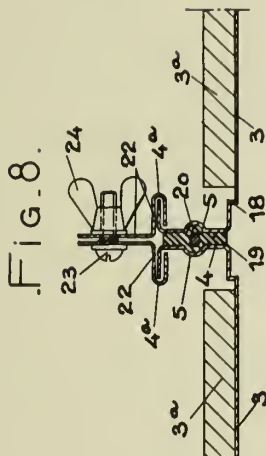


Fig. 9.

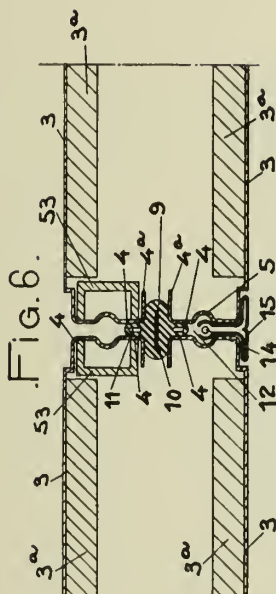
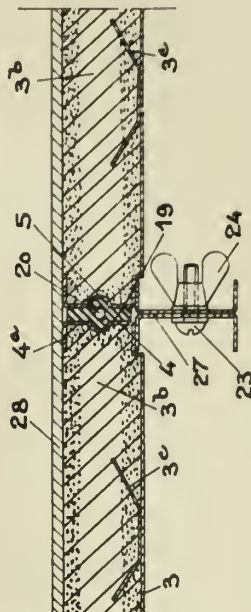
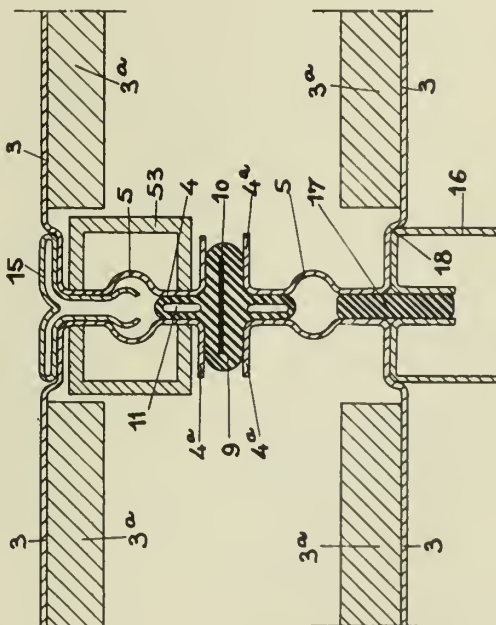


Fig. 7.



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5 Sheets-Sheet 4

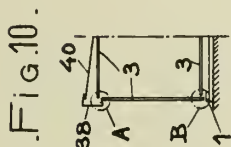
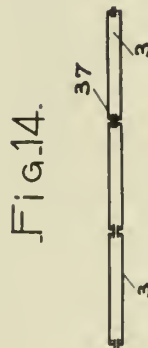
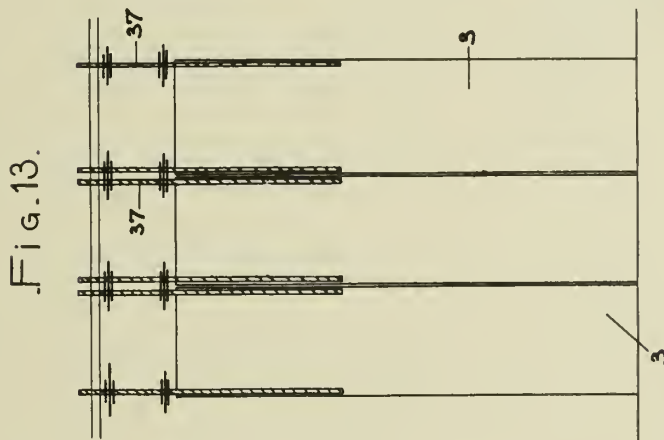
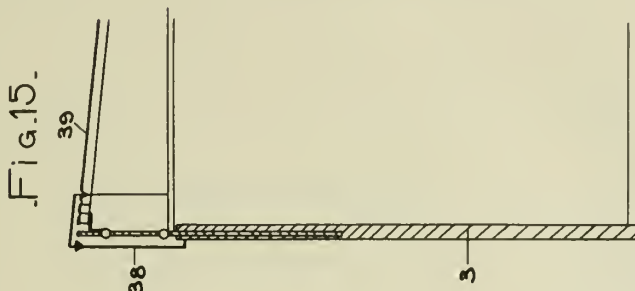


Fig. 16.

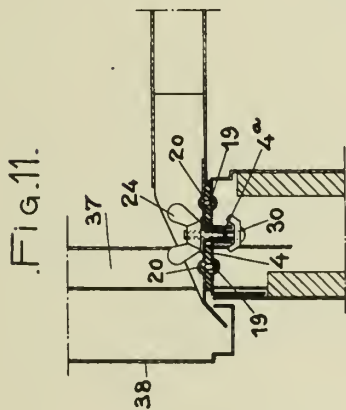
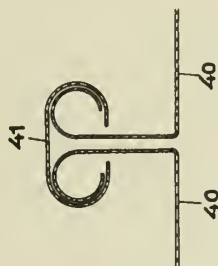
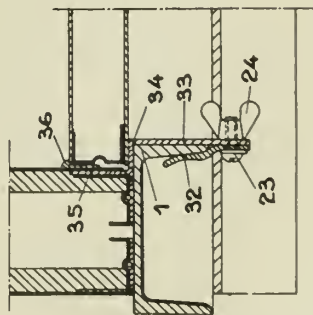


Fig. 12.



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PUBLISHED

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5 Sheets-Sheet 5

Fig. 20.

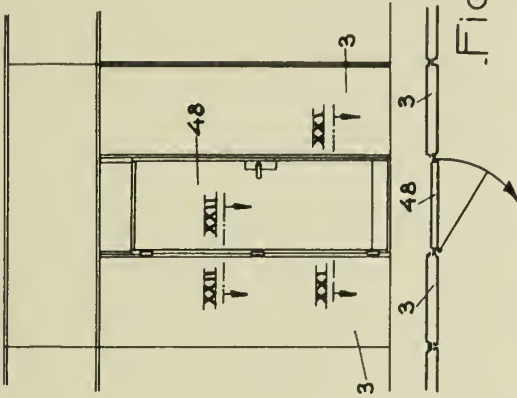


Fig. 21.

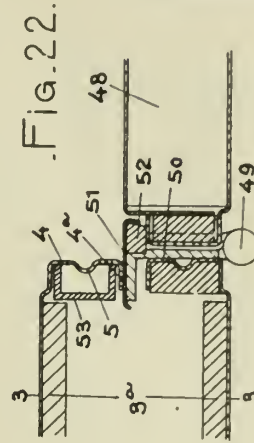


Fig. 22.

Fig. 18.

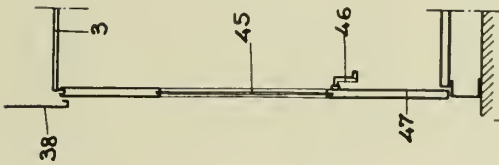


Fig. 17.

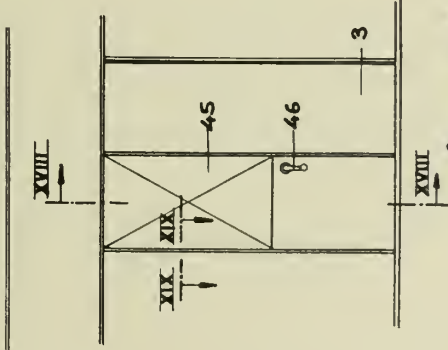
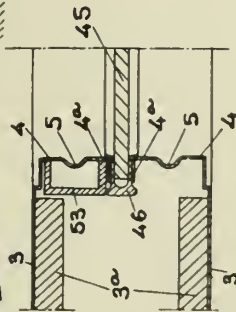


Fig. 19.



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# ALIEN PROPERTY CUSTODIAN

## HIGH FREQUENCY IRON CORE

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Application filed May 15, 1940

High-frequency iron-cores consisting of tenuous wires offer the advantage over dust-cores that they possess higher permeability. It is known in the prior art that these iron wires may be braided or twisted together to result in a strand in order to simplify and facilitate the handling of thin wires. What is further attained by stranding is that the magnetic fields, in spite of capacitively closed eddy-current paths, become uniformly distributed throughout the entire cross-section as the high-frequency currents in high-frequency litz wires or strands. It is understood that because of the fact that the concentric, annular eddy-currents paths are distributed over the various cross-sections of the core, in the absence of the twisting or stranding, the magnetic field in the interior of the core is weakened for the reason that the eddy-currents set up a counteracting field. Hence, an additional advantage of the stranding of the litz arrangement is that the reluctance as contrasted with cores consisting of parallel wires is diminished and that the active permeability is increased. At the same time, by the more uniform distribution of the magnetic field over the constituent wires the losses are reduced, for these losses grow with the field density at a rather greater than unity. Using sufficiently slender wire the losses are of the same order of magnitude as with dust-cores.

It is known in the earlier art to wrap or coil iron wire or iron litz wires or strands to result in annular coil cores. The winding of iron-wire litz in this connection may be carried into practice according to the same viewpoints and rules which apply to current windings used in high-frequency coils.

According to the invention, the two ends of a core coiled up from iron litz wires or iron ribbon or band are connected together in such a way

that a ferromagnetic path (shunt) results. To this end it may suffice in certain circumstances if the said ends are so placed in contiguous relationship to each other that large surfaces come to face each other.

Because of the fact that several iron turns are connected in series and that, therefore, a junction in several turns is omitted, the magnetic contact resistance or reluctance liable to arise at such junction does not prove by far so troublesome as in the case of iron-cores which consist only of a single turn.

The basic idea of the invention shall now be explained in more detail by reference to the exemplified embodiment thereof illustrated in the drawing. Referring to the drawing, the iron core E being linked with the current winding W consists of a litz wire winding the two ends of which are welded together, for instance, at the junction indicated at V.

The invention is inapplicable in the case of iron-cores which consist merely of wound thin iron wire, that is to say, cores of the kind customarily used in modulator chokes and frequency multipliers, for the reason that in these cores connection of the two ends is practically immaterial because of the great number of turns. But if the core is built up of a limited number say, ten turns of iron wire litz or of very tenuous iron band or of twisted iron bands, the reduction in reluctance will become noticeable so much more so the smaller the number of the turns.

The invention will be found useful also where the iron core is subjected to biasing magnetization by means of an additional electromagnet as known in the prior art, for the purpose of varying the inductance of the RF coil.

FRITZ BERGTOLD.



PUBLISHED

MAY 18, 1943.

BY A. P. C.

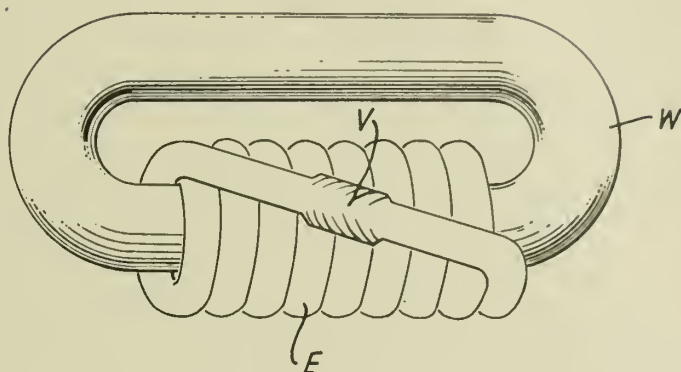
F. BERGTOLD

HIGH FREQUENCY IRON CORE

Filed May 15, 1940

Serial No.

335,224



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# ALIEN PROPERTY CUSTODIAN

## METHOD OF AND APPARATUS FOR STERILISING LIQUID FOODSTUFFS

Alexandru Bojinescu and Ion Plonski, Bucharest Roumania; vested in the Alien Property Custodian

Application filed May 16, 1940

This invention relates to a method of and apparatus for sterilising alimentary liquids such as fruit juices, wines, beer and milk.

In accordance with the invention metallic ions are injected into a current of the alimentary liquid and are effectively dispersed therein by simultaneously subjecting said liquid to oscillations of supersonic frequency generated by a crystal-controlled (piezo-electric) oscillatory circuit.

A preferred form of apparatus for carrying out the method of the invention comprises a cell having electrodes therein for ionisation of the liquid under treatment by electrolysis, at least one of said electrodes (the anode) being constructed of a preferably oligodynamically active, metal. One or more walls of said cell are adapted to transmit to the liquid flowing there-through supersonic oscillations generated by a crystal-controlled parallel resonant circuit, by locating the actual oscillating crystal adjacent to or in the wall or walls of the cell, thereby dispersing the metallic ions generated in the vicinity of the electrodes throughout the liquid.

For example, a cylindrical cell having ionising electrodes and inlet and outlet for the liquid under treatment, is provided with an end wall constructed of a sheet of piezo-electric quartz and forming part of a crystal-controlled parallel resonant oscillatory circuit through (tin foil) electrodes attached to opposite sides of said quartz sheet.

In order that the invention may be more clearly understood, reference is made to the accompanying drawings, which illustrate diagrammatically and by way of example, three embodiments of apparatus suitable for carrying the same into practical effect, and in which:

Fig. 1 shows one embodiment;

Fig. 2 a second embodiment; and

Fig. 3 is a third embodiment.

Referring to Fig. 1, 1 denotes a cylindrical cell with inlet and outlet 2 and 3 respectively for the liquid under treatment. Within said cell 1 is located a cylindrical perforated anode E<sup>2</sup> surrounding an axially arranged cathode E<sup>1</sup>, said electrodes being connected to a battery B and a series rheostat R and an ammeter M.

The base of cell 1 is formed by a piezo-electric sheet 4 of quartz, having sheets of foil 5 and 6 on opposite sides whereby said quartz sheet is connected to a parallel resonant oscillatory circuit consisting of the inductance 7 and variable condenser 8. This circuit is tuned by means of the condenser 8 to the resonant supersonic frequency of the crystal 4, the resulting oscillations

being thus transmitted directly through the liquid passing through cell 1.

In the embodiments shown in Figs. 2 and 3, the cell is again essentially cylindrical in shape, but the quartz crystal is located either adjacent the curved wall, or in the curved wall, instead of at the end. The cell is provided with end compartments 11 and 12, containing the perforated anode E' and the perforated cathode E<sup>2</sup> respectively, connected to a battery B by means of the rheostat R and the ammeter M.

The middle portion of the cell is somewhat constricted and bounded by a cylindrical glass wall 9 (Fig. 2). Concentrically surrounding glass wall 9 is the piezo-electric crystal 10 of cylindrical form, having sheets of metal foil 13 and 14 secured to the inner and outer curved surfaces thereof, whereby said cylindrical crystal forms part of the parallel resonant oscillatory circuit consisting of the inductance 16 and the variable condenser 15.

The cylindrical crystal 10 is itself located in an annular chamber the inner walls of which is constituted by the glass wall 9 and the outer wall by a further cylindrical glass wall 17. Said chamber is closed by end pieces 18 of ebonite or other insulating material, and is filled with a liquid insulator, such as petroleum or liquid vaseline.

In the embodiment of Fig. 3, the construction is similar to that of the embodiment of Fig. 2, but with the essential difference that the curved walls of the ionising cell are bounded directly by the piezo-electric crystal 10' itself, which also serves to separate the alimentary liquid undergoing treatment from the insulating liquid in the annular chamber formed by the cylindrical crystal 10' and the outer glass cylinder 17. In both the embodiments of Figs. 2 and 3, 19 denotes connecting bolts, threaded at the ends, for assembling and fixing the end pieces 18 in position. The members 20, which are also constructed of insulating material, are screw-threaded and adapted to be screwed into the end pieces 18 to form the electrode chambers 11 and 12 respectively; 21 and 22 are the outlet and inlet respectively for the alimentary liquid under treatment.

According to a fourth embodiment (not shown) the quartz crystal cylinder depicted in Figs. 2 and 3 is replaced by the composite crystal cylinder forming the subject of our Application Serial No. — of even date.

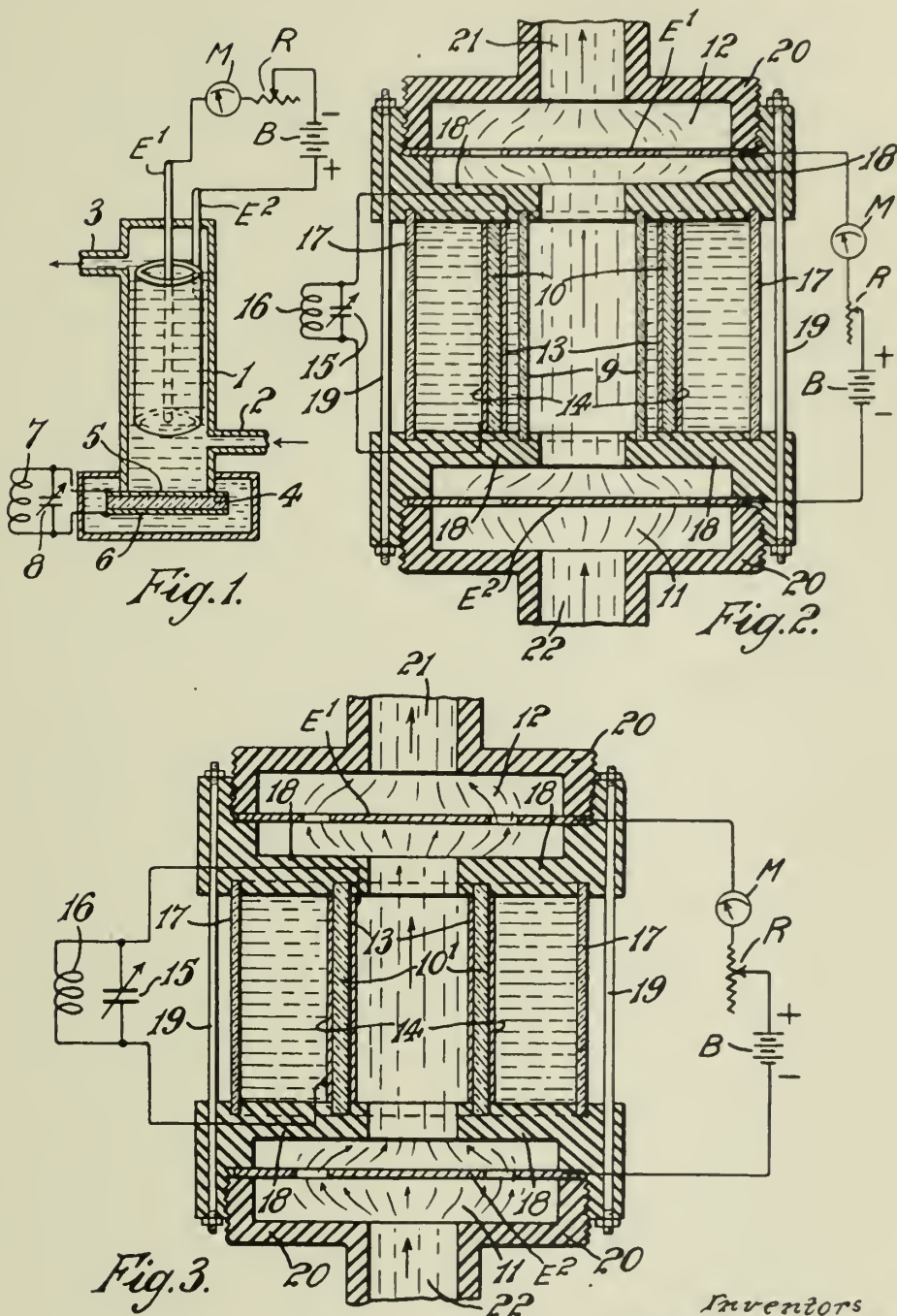
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MAY 18, 1943.  
BY A. P. C.

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METHOD OF AND APPARATUS FOR STERILISING  
LIQUID FOODSTUFFS  
Filed May 16, 1940

Serial No.  
335,549



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By Moses P. V. Hill  
Their Attorneys.



ALIEN PROPERTY CUSTODIAN

BRAKES

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Application filed May 20, 1940

This invention relates to brakes and more particularly although not essentially to brakes suitable for road vehicles such as omnibuses and to aeroplanes.

The main objects of the invention are to provide means of simple constructional form for operating brake shoes which will provide efficient servo action and parallel brake motion.

In order that the invention may be more clearly understood, it will now be briefly described with reference to the accompanying drawings, in which:

Figure 1 is a side elevational view of a brake made in accordance with the invention.

Figure 2 is a sectional view on the line II—II in Figure 1.

Figure 3 is a section on the line III—III in Figure 1.

Figures 4, 5, 6 and 7 are side elevations showing modified constructions of brakes made in accordance with the invention.

Figures 8, 9, 10 and 11 are sectional views on the lines 8—8, 9—9, 10—10 and 11—11 in Figure 7, and

Figure 12 is a side elevational view of a modified form of brake made in accordance with the invention.

In Figures 1, 2 and 3:

The brake carrier 1 which is fixed to the axle casing has a ring-shaped bearing extension 2 on which two guiding rings 3 and 4 are rotatably mounted. Each of these two guiding rings has two lugs 5, 6 and 7, 8 which are 180° apart. Pivot pins 13, 14 (15, 16) are housed rotatably in holes in these lugs. Levers 9, 10 (11, 12) are connected at one end to these pivot pins. In each of the brake shoes 21, 22 are two holes located towards their ends, in which pivot pins 17, 18 (19, 20) have their bearing. The other ends of the levers 9, 10, 11, 12, are connected to the last mentioned pivot pins. Slots 25, 26, are provided in the middle of the brake shoes 21, 22, through which pass pins 23, 24, that are fixed in the brake carrier 1. The levers 27, 28, are rotatably mounted on the pins 23, 24 as well as on the bolts 17, 19.

On each of the bolts 13, 15, are mounted guiding pieces 31, 32, which can slide tangentially in cam blocks 35, 36. The sliding movement serves for the adjustment of the brake shoes and is carried out by worms 33, 34 and worm wheels 29, 30. The worm wheels 29, 30, are fixed to screws 37, 38. The latter have their nuts in the connecting blocks 31, 32. The cam blocks 35, 36 are secured against radial movements by means of dovetails. The dovetails are part of the rings

3, 4 and fit in grooves in the cam blocks. By turning the cam 39 the blocks 35, 36 are moved apart. The distances of the points 98 and 99 from the cam centre are unequal in order to equalise the movement of the cam blocks. The return movement of the two rings and the brake shoes is effected by means of the tension spring 40.

In the construction illustrated in Figure 4, the lugs 41, 42 of the guiding rings 3, 4, have slots 45, 46 in which bolts 43, 44 can slide. The bolts are rotatably mounted in the brake shoes 21, 22.

Figure 5 shows the same principle for the four-shoe brake. The rings 3, 4 possess four lugs each (47, 48, 49, 50). In the lugs are slots 55, 55a, 56, 57, in which the bolts, in the brake shoes, can slide. Pins 67 are fixed in the brake carrier. The levers 66 are mounted on the pins 67 and on bolts 52. The cam block 60 has two fork shaped extensions reaching to the middle of the brake shoe. At the ends of these extensions are holes in which the socket 61 is borne. In the socket is a thread for the screw 62. A worm wheel 65 is connected with the screw 62 which is carried by a lug 63 on the rings 3, 4. The adjustment is effected by means of the worm 64. The return movement of the brake shoes to their normal positions is effected by means of springs 68.

In the four-shoe brake shown in Figure 6, the lugs 69, 70, 71, 72 which are part of the guiding rings 3, 4, have holes in which the bolts 73, 74, 75, 76, are rotatably mounted. In each of the brake shoes 81, 82 are two holes in which the bolts 81, 82, 83, 84 are carried. The levers 77, 78, 79, 80 are mounted on the bolts 73, 74, 75, 76 and on the bolts 81, 82, 83, 84, the bolts being rotatable in the levers. The pin 90 which is fixed in the brake carrier 1 passes through the slot 91 of the brake shoe 92. The lever 89 is mounted on the bolt 82 and on the pin 90.

The shoes may each have a radial opening of tapered form—the larger end being innermost—midway between its ends. The opening receives a block on the pivot, which block may carry needle bearings. When the shoes slide outwardly, a clearance is provided between the blocks and the larger ends of the openings whereby sufficient rotary movement is permitted to facilitate obtaining the servo action.

It will be seen that the rings are connected to the brake shoes in such manner that rotary movement of the rings in opposite directions effects outward movement of the shoes. The rings are mounted within or adjacent to the brake shoes and concentric therewith. In a modifica-

tion, the middle of each shoe is mounted on the pivot of a toggle formed by two links having their separated ends connected pivotally one to each ring. Operation of the brake is effected by rotary movements of the rings in opposite directions whereby the two toggles are operated to force the shoes apart against the brake drum. The pivots of the two toggles are on the same diameter of the brake drum and the links of each toggle may be about  $45^\circ$  apart. The links may have a length equal to about the radial depth of the brake shoes or a little more. The shoes may also be pivotally mounted at adjacent ends on spindles about which the shoes are moved by the toggles.

The shoes may have a slight rotary displacement to provide a servo action, and for this purpose a clearance may be provided at the pivot spindles at the ends of the shoes and also if required at the toggle pivots, to enable the shoes to have the required movements.

An equalising linkage or lever system may be provided between adjacent ends of the shoes, or adjacent lugs on the rings, to operate the toggles and shoes with balanced forces.

The servo action in one direction will act through the leverage of one link of each of the toggles tending to move them towards their radial positions, the other links being similarly used in the opposite direction.

The rings may have lugs connected by a spring between the pivotally mounted adjacent ends of the shoes, which spring brings the shoes to their normal or off positions. Actuation of the brake may be effected mechanically or by fluid pressure acting on lugs on the rings adjacent to the other ends of the shoes. Adjusting means may be provided on these lugs.

The rings may be mounted on roller or needle bearings.

In Figure 7, a ring 103 has lugs 104 connected by pins 105 and links 106 to the pivot pins 107 carried by the brake shoes 108. The pivot pins 107 are connected by links 109 to the fixed pins

110, the apertures in the links adjacent to the fixed pins being elongated as shown at 111. The links 109 are pulled by springs 112. The arrangement 113, 114 applies power to the ring and the spacing between the part 114 and the lug 104 can be adjusted by the arrangement 115, 116, 117. The shoes are connected to each other by guides 119 sliding in guideways 120.

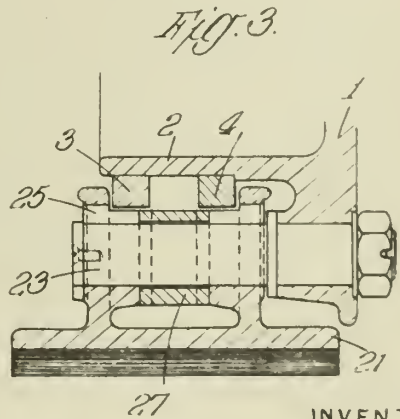
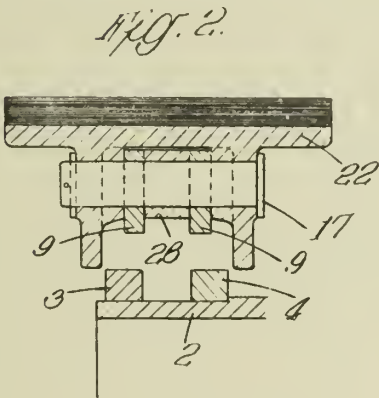
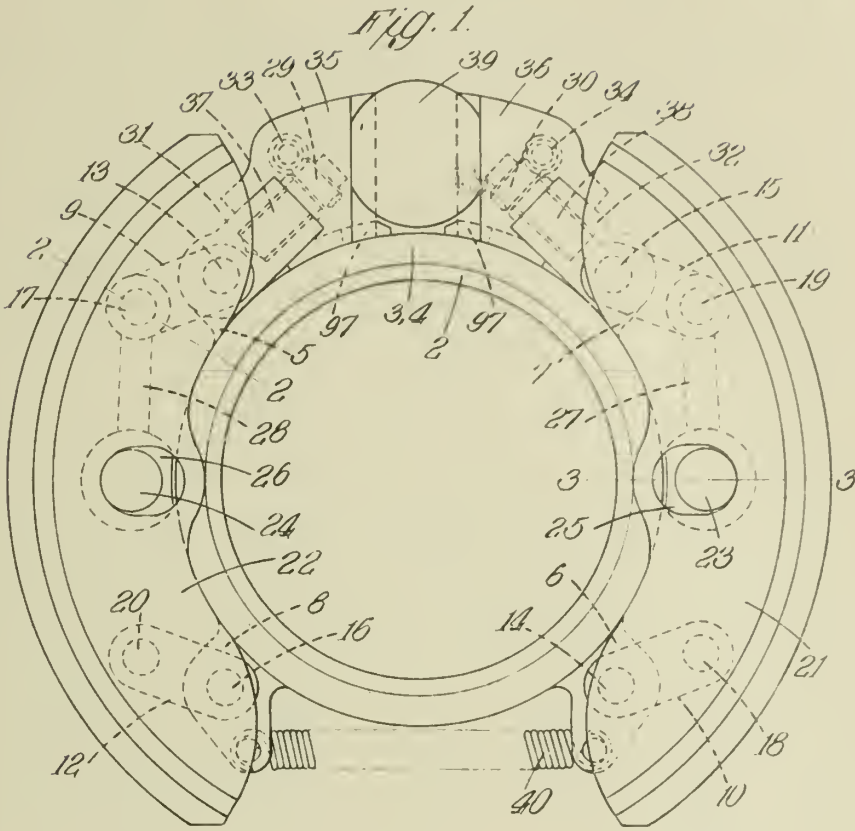
In the constructional form of the invention shown in Figure 12, a single ring 103a is provided. This ring has two radially extending lugs 104a offset  $180^\circ$  from each other and disposed a short distance one on one side and one on the other side of a line connecting the middle points of two brake shoes 108a. These lugs are connected by links 106a each to a pivot pin 107a carried by the brake shoe midway between its ends. These pivot pins are linked by links 109a to pins 110a carried by a fixed part. The apertures in these links engaged by the fixed pins 110a are slightly elongated as at 111a. The two pairs of links form toggles, each pair being opened to about  $90^\circ$  or a little more. A short rotary movement applied to the ring in one direction tends to collapse the toggles and force the shoes outwards. The trailing end of each shoe is connected by a link 122a each to another outwardly projecting lug 112a on the ring, whereby a parallel action of the shoes is ensured. A spring 124a pulls on a lug 125a for returning the ring to its normal position. Other springs 120a pull on the ends of the toggle links adjacent to the fixed pins so that the elongated apertures are drawn towards the trailing ends of the shoes. When the brake is applied, the braking force will tend to move the shoe in the direction of the rotating brake drum, thereby increasing the pressure of the shoes through the leverage of the toggle links and of the links at the trailing ends of the shoes. The elongated apertures permit any slight movement of the shoes necessary for this purpose. A powerful servo action is thus exerted on both shoes.

EMIL ZIPPER.

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MAY 18, 1943.  
BY A. P. C.

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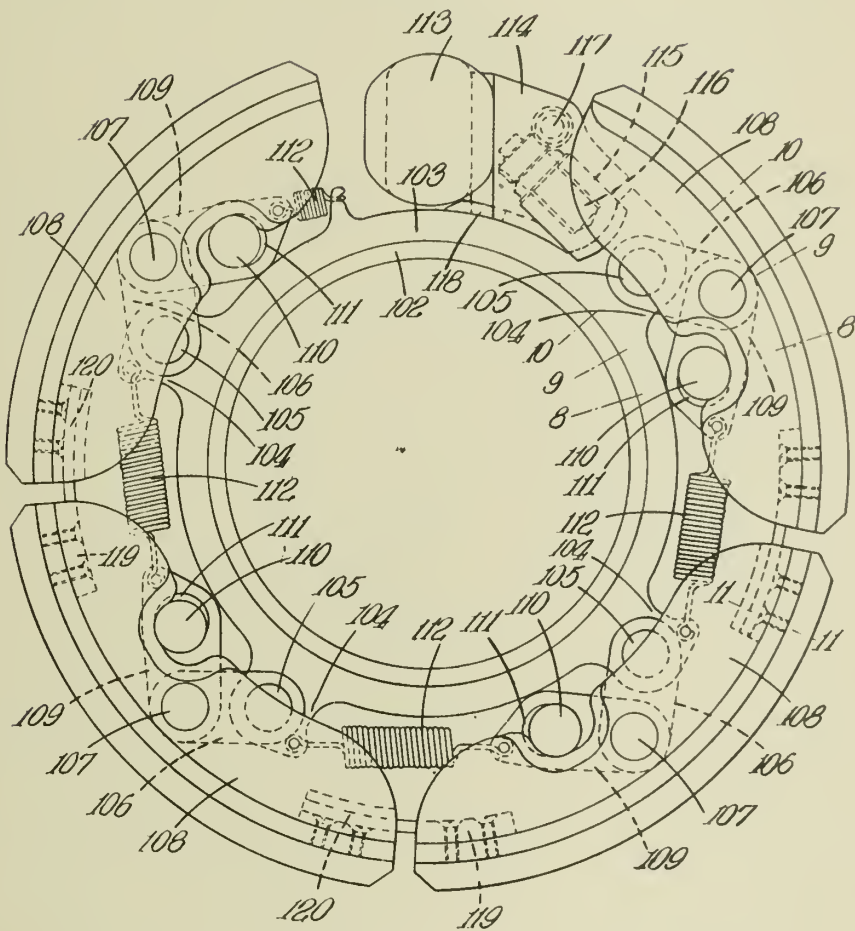
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Fig. 7.



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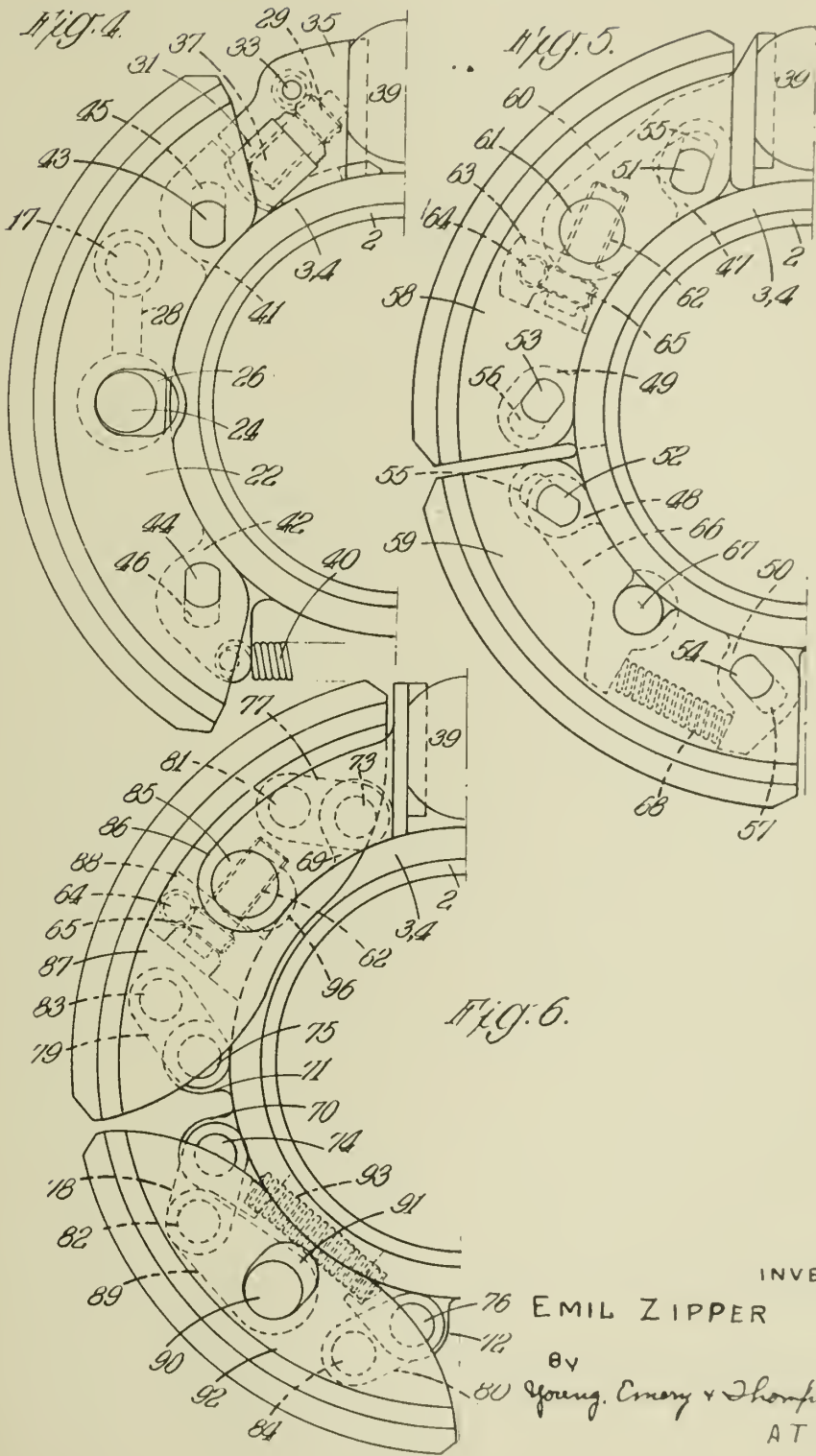
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Fig. 11.

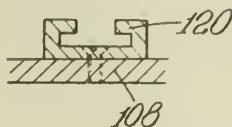
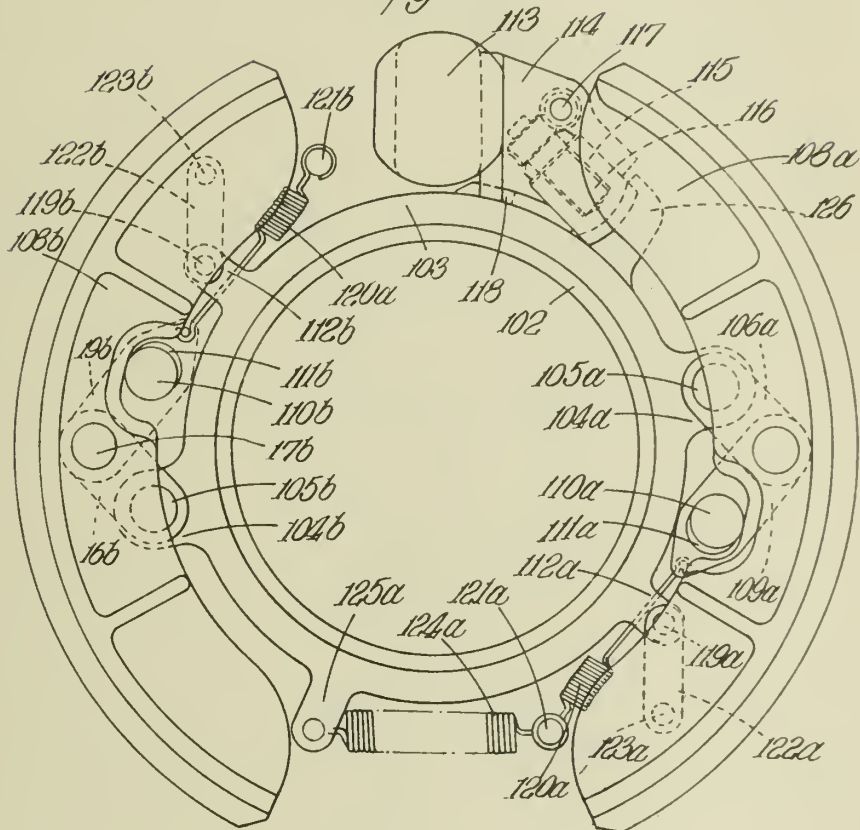


Fig. 12.



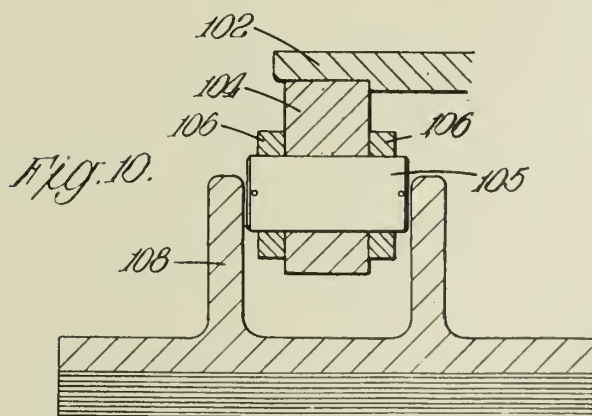
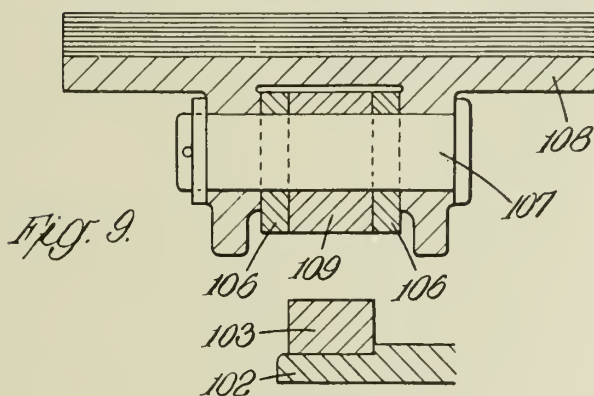
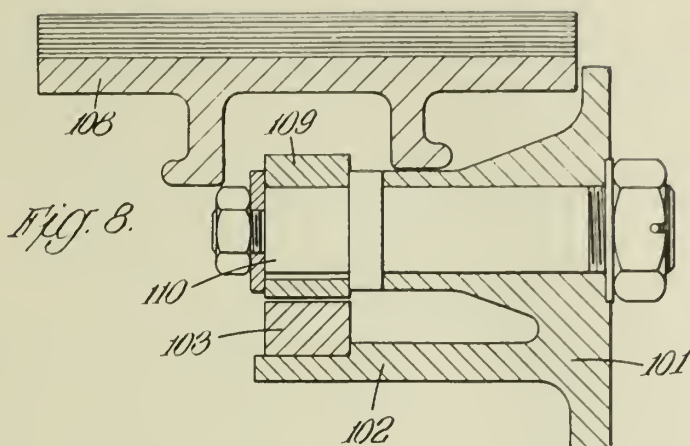
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ALIEN PROPERTY CUSTODIAN

PROCESS FOR THE MANUFACTURE OF ALKALINE EARTH METAL SALTS OF ADENOSINE POLYPHOSPHORIC ACIDS

Herbert Schwaneberg, Berlin-Tempelhof, Germany; vested in the Alien Property Custodian

No Drawing. Application filed May 20, 1940

It is known from the work of Needham and van Heynigen which was published in "Nature" Volume 135 (1935) pages 585 and 586, that adenosine triphosphoric acid is formed by the addition of phosphoglyceric acid and adenylic acid to muscle extract containing alkali. Working with muscle extract is, however, too complicated and expensive in practice, the more so because the yields obtained are not satisfactory.

It is also known from the work of Ostern and Terszekowec published in Hoppe-Seyley's Zeitschrift für physiologische Chemie, Volume 250 (1937) pages 155-157 that adenosine, in the presence of inorganic phosphate and under the action of yeast, forms adenosine triphosphoric acid in addition to adenosine-5-monophosphoric acid.

A process of this nature is described and claimed in U. S. A. specification 2,174,475. When working in accordance with this process, however, adenosine-5-monophosphoric acid is mainly obtained; sometimes it is mixed with some adenosine triphosphoric acid or also with some adenosine polyphosphoric acid.

An object of my present invention is to obtain, instead of the above-mentioned mixture which always contains considerable amounts of adenosine monophosphoric acid, substantially only adenosine polyphosphoric acids, and especially adenosine triphosphoric acid, which are 75-100% pure, and in particular, are free from adenosine monophosphoric acid.

A further object of my invention is to obtain a new preparation for acting on the circulatory system, especially of human beings, which is more efficacious than the known adenosine monophosphoric acid which has hitherto been used for this purpose, namely a preparation which consists for the most part of adenosine polyphosphoric acids and especially adenosine triphosphoric acid.

A still further object of my invention is to obtain therapeutically valuable salts such as, for example, calcium salts of adenosine polyphosphoric acids, directly from the reaction mixture which contains the crude adenosine polyphosphoric acids and adenosine triphosphoric acid in particular, that is to say without forming other compounds of these acids.

Finally, yet another object of my invention is to convert the adenosine polyphosphoric acids directly or indirectly into salts of various therapeutically valuable metals.

Further objects and advantages of my present

invention will be clear from the following description and examples.

Adenosine as such or any compound which can be split up to form adenosine, such as for example yeast nucleic acids, can be used as the starting material in the new process as in the known process. As the phosphate there may be used either inorganic phosphate buffer solutions or also the known sugar phosphoric acid esters such as, for example, the so-called Neuberg, Robison, Cori, Embden, Harden and Young esters; phosphoglyceric acid or mixtures of organic and inorganic phosphate can also be used. These starting materials are converted by the action of fresh yeast, dry yeast or yeast extract or yeast plasmolysate into adenosine triphosphoric acid and adenosine polyphosphoric acid. It is important that the yeast be added to the reaction mixture in pre-fermented condition and preferably in stages. The yeast contains two enzymes of which the one, namely the so-called phosphatase, has a dephosphorylating action, while simultaneously a second enzyme which is present in the yeast has a phosphorylating action, namely in the 5-position of the ribose contained in the adenosine. It has now been found that by a vigorous fermentation of the yeast the result can be obtained that this second enzyme strongly predominates, so that the phosphorylation of the adenosine proceeds not only as far as muscle adenylic acid (adenosine-5-monophosphoric acid) but up to the desired adenosine polyphosphoric acid. The predomination of the phosphorylating enzyme may be ensured, in particular by adding the vigorously fermenting yeast in stages to the reaction mixture in order to prevent with certainty the production of phosphatase. As soon as analysis shows that the taking up of phosphate has proceeded sufficiently far the mixture is quickly boiled in order to destroy the phosphatase present. This boiling must take place as quickly as possible and preferably within about 10-20 minutes in order to prevent hydrolysis of the polyphosphoric acids formed. For the same reason the highly heated mixture must also be rapidly cooled down since otherwise dephosphorylation can occur by hydrolysis.

The solution obtained in this manner which contains practically the whole of the adenosine in the form of polyphosphoric acids is preferably worked up in the following manner.

The liquor which is freed from insoluble matter by filtration is treated with a concentrated solution of a salt of an alkaline earth metal, such as barium acetate for example, in order to pre-

precipitate the whole of the adenosine polyphosphoric acids in the form of their barium salts. This barium salt is then treated with dilute sulphuric acid in such a way that the whole of the barium is present as sulphate. The solution, which contains the free adenosine triphosphoric acid and adenosine polyphosphoric acid is rapidly separated from the precipitate by centrifuging in order that the excess of acid may cause no harmful hydrolysis and is then poured into 5-10 times its amount of alcohol. By this means adenosine triphosphoric acid is separated as a white powder. It is practically free from inorganic phosphate and is contaminated only by a small quantity of hexose diphosphoric acid from which it can easily be separated if this is desired.

Another method which leads directly to therapeutically useful salts of adenosine polyphosphoric acids is to treat the solution, after boiling and filtering, with a concentrated solution of a calcium salt, for example calcium chloride, in the calculated quantity and to add alcohol. In this way the calcium salts of adenosine polyphosphoric acids are precipitated and can be used directly as a medicament.

The adenosine polyphosphoric acids which are obtained in a degree of purity from 75-100% can be used for the manufacture of potassium, sodium, magnesium, manganese salts and so forth which are important as agents for affecting the circulatory system.

The invention will now be explained in greater detail with the aid of the following examples.

#### Example 1

1 kg. of beer yeast is stirred with 1 litre of 20% glucose solutions, 3 litres of

$$\frac{m}{3}$$

sodium phosphate (pH7) and 5 litres of a 1% adenosine solution are added and the mixture is fermented at 37° C. After 1 hour 1 kg. of yeast, which has been caused to ferment with 1 litre of 10% glucose solution and 300 cc. of toluene are added and the addition of the yeast is repeated after a further hour. The stirring is continued during the whole experiment. The amount of inorganic phosphorus taken up is continuously checked and the experiment is broken off when phosphorus is no longer taken up. Then the solution is rapidly boiled and then immediately cooled down and filtered. The solution is made alkaline with caustic soda solution and is precipitated with barium acetate. The crude barium

adenosine polyphosphate is centrifuged and washed with water and alcohol.

If the crude phosphate, while being cooled, is stirred with the necessary quantity of dilute sulphuric acid and at once centrifuged and the solution poured into several times its volume of alcohol and stirred, a white flocculent product is obtained which consists substantially of crude adenosine polyphosphoric acids. This is at once filtered off and washed with alcohol and ether. It is very sensitive to moisture and must be dried at once in the desiccator.

#### Example 2

1 kg. of beer yeast is stirred with 1 litre of 10% glucose solution, 3 litres of

$$\frac{m}{6}$$

sodium phosphate (pH7) and 5 litres of 1% adenosine solution are added and the mixture is fermented at 37° C. After 20 minutes 75 grams of the sodium salt of fructose diphosphoric acid (1 litre dissolved) and 300 cc. of toluene are added and after a further 20 minutes 1 kg. of yeast which has been pre-fermented with 1 litre of 10% glucose solution is again added. Instead of fructose diphosphoric acid the corresponding quantity of phosphoglyceric acid can be taken. The further treatment is carried out in the same way as in Example 1.

#### Example 3

1 kg. of beer yeast is stirred with 1 litre of 10% glucose solution and after the vigorous fermentation has begun 5 litres of 1% adenosine solution, 150 grams of the sodium salt of fructose-diphosphoric acid in 3 litres of water, or the corresponding quantity of the sodium salt of phosphoglyceric acid, and 300 cc. of toluene are added. The mixture is stirred and is kept at a temperature of 37° C. After 30 minutes 1 kg. of beer yeast which is fermenting with 1 litre of 10% glucose solution is again added. The further treatment then proceeds as described in Example 2.

Some preferred methods of carrying the invention into effect have been described in detail, but the invention is not limited in any way to the reaction temperatures, concentrations and other conditions which have been numerically indicated. These can be varied according to the circumstances of a particular case without departing from the scope of the invention.

HERBERT SCHWANE BERG.

# ALIEN PROPERTY CUSTODIAN

## SORTING MACHINES

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Application filed May 20, 1940

The present invention relates to apparatus for gauging cylindrical glass tubes, the necks of vials, and similar glass articles, both interiorly and exteriorly, and for sorting the articles to separate those having incorrect measurements from those the measurements of which are those desired for particular uses. Many glass receptacles in use at the present time are provided with either external or internal screw threads to accommodate threaded closures, the latter being applied to the receptacles by machine. Other types of receptacles are closed by means of rubber plugs which may be forced inwardly of the receptacle to function as pistons and thus expel the contents therefrom. It is important that the diameters of the receptacles and the threads thereon be kept within predetermined limits to insure an accurate fit of the cooperating closures and plugs.

This invention has for one of its objects the provision of gauging devices designed to reject articles having incorrect dimensions and the separation thereof from articles having the desired predetermined measurements.

Another object of the invention is to provide conveying mechanism of such a character that it can be associated with glass shaping machinery now in use and permit gauging without removing the articles from the shaping apparatus to another machine.

Other objects will be apparent from the following description of the invention taken with the accompanying drawings, in which

Fig. 1 is an end elevation of the measuring apparatus, parts thereof being broken away;

Fig. 2 is a side elevation, partly in section, of the apparatus illustrated in Fig. 1;

Fig. 3 is an end view of a modified form of the invention; and

Figs. 4 and 5 are fragmentary side and end view respectively of still another form of measuring device.

In the drawings vials 1, 1', are supported on adjacent rollers 2, 2', the perimeters of which overlap, during the usual heating and shaping steps. A conventional transfer mechanism consisting of notched racks 3, having a vertical as well as a horizontal reciprocatory movement, transfers the vials from one set of supporting rollers to an adjacent set of rollers, that is from one processing station to the next station. The combined reciprocatory movements of the transfer rack are obtained through arms 4 each connected at one end to the rack and having its other end fast on shaft 4'. Also fast on shaft 4'

is an arm 8 to which is pivotally connected the connecting link 9, the latter being adapted for reciprocatory by suitable cam means (not shown). Journaled in bearings 5' secured to the frame 13 of the machine is a shaft 6' to the latter of which are secured arms 5 and 6. Connecting link 7, adapted to be reciprocated by a suitable cam (not shown) is pivotally connected to arm 6. In Fig. 2 the arrows and dotted lines above the racks indicate the manner in which the vials are lifted and transferred a distance equal to that between adjacent rollers by the combined vertical and horizontal reciprocatory of the transfer rack.

As will be seen in Figs. 1 and 2, a pair of longitudinal notched racks are supported by standards 12, the latter being slidably mounted on rods 13 and 14 and adjustable transversely thereon to accommodate vials of different lengths. The rods 13 and 14 are supported by posts 15 which in turn are fixed to the frame 16. Also mounted for slidable movement on rods 13, 14, and adjustable thereon, are standards 12' supporting guide plates 17 which, together with fixed guide 18, position shaped vials with respect to the gauging devices hereinafter described.

Referring to Fig. 2 it will be seen that plates 17 are provided with two or more recesses, as at 19, and that there are adjustably fixed to plate 17 on opposite sides of the recesses gauging members or fingers 12. Stations I, II and III are processing stations while stations IV and V are gauging or sorting stations. The fingers 10 at station IV, for instance, are spaced a distance slightly less than the diameter desired for the threaded necks of the vials. If the threaded necks are less than the desired or predetermined gauge the vials are permitted to pass the gauge at station IV. The fingers at station V, on the other hand, are accurately spaced to permit only those vials having threaded necks of the proper diameter to pass therethrough. Should the necks be larger than the desired size they will be conveyed beyond station V to station VI along racks 11, from which they may be removed by the attendant. It will be seen that inclined chutes 20, 21, permit the vials sorted at stations IV and V to be delivered to suitable containers.

To insure passage of the vial between the gauge fingers suitable pressure mechanism is employed. This mechanism comprises a cam operated reciprocating link 22 operating through bell-crank 23 and link 23' to lower and elevate rod 25 slidable in bearing 24. Fixed to rod 25 is a transverse arm 26 to which are fastened longitudinally ex-

tending arms 26', each of the latter being apertured to accommodate pressure pins 27. These pins are freely slidable in arms 26' but are urged downwardly by springs 27' bearing against collars 27'' on the lower ends of the pins and against the arms 26'. Springs 27' are readily yieldable but are sufficiently heavy to tilt those vials capable of passing the gauge fingers. On the other hand they yield when the vial is too large to pass the fingers. It will therefore be apparent that the vials will be sorted according to their deviation from a predetermined size, first the undersize vials being separated from the others, then the desired size, and finally the oversize receptacles are removed.

The foregoing description has been specific in that a particular type of vial, viz: those having exteriorly threaded necks, has been illustrated. The mechanism is also adapted for gauging interior threads as well as smooth surfaces. In Fig. 3, for instance, the gauging apparatus is modified to sort plain tubular blanks according to their internal diameters. In this form of the invention the blank 28 is so supported that a slight movement of the vial in an axial direction will unbalance the blank and permit it to tilt, whereupon it will fall into a suitable receptacle. As illustrated in this figure, the conveying means comprises a sprocket driven chain 29 having pegs or fingers 29' thereon. Preferably, the chain is driven intermittently. The blanks are supported by plate 30 and notched bar 31, the notches in the latter accurately positioning the blanks with respect to the gauging device. The latter consists of a gauge member 34 held in the reciprocable rod 33 slidable in bearing 32. The bearing is adjustable horizontally as well as vertically, set

screw 43 and nut 44 being provided for this purpose. Lever 35 fulcrumed at 36 is adapted to be rocked by cam 37, spring 38 normally urging one end of the lever toward the cam. The other end of lever 35 is provided with a yoke 45 which cooperates with pin 46 on collar 47, which is adjustable on rod 33. A plurality of spaced gauge members, each a different size, move toward the blanks during the operation of the gauging apparatus. Obviously, if the gauge member is larger than the internal diameter of the blank the latter will be moved axially until it tilts and falls onto slide 39 from which it falls into basket 40. In this manner the blanks may be successively sorted into two or more sizes.

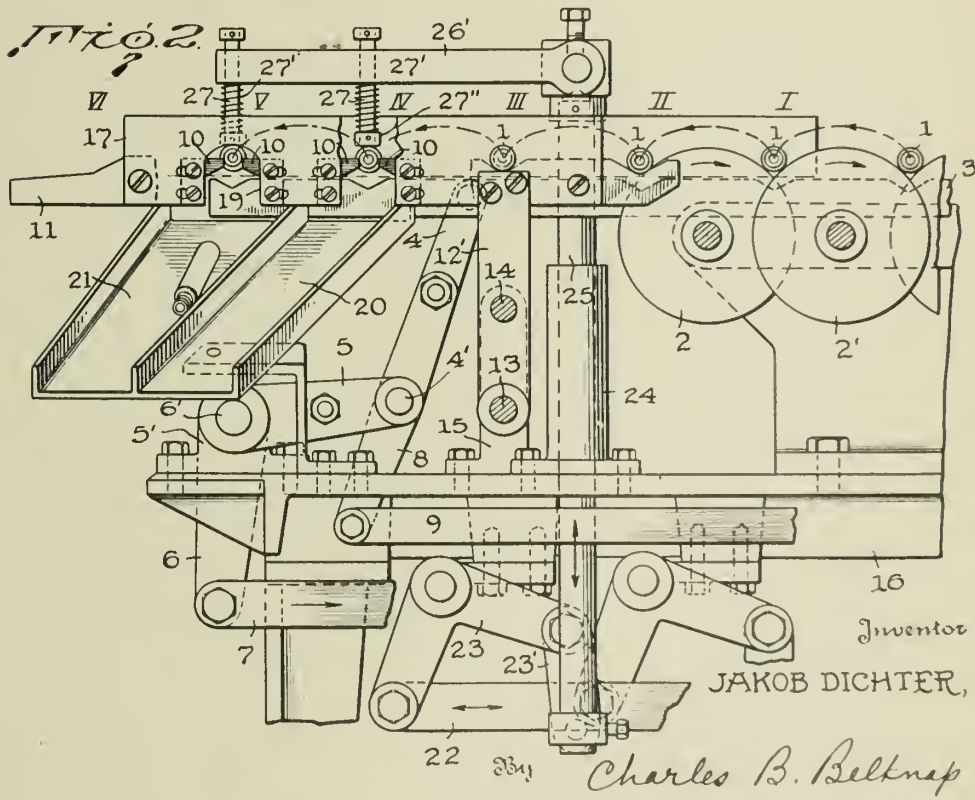
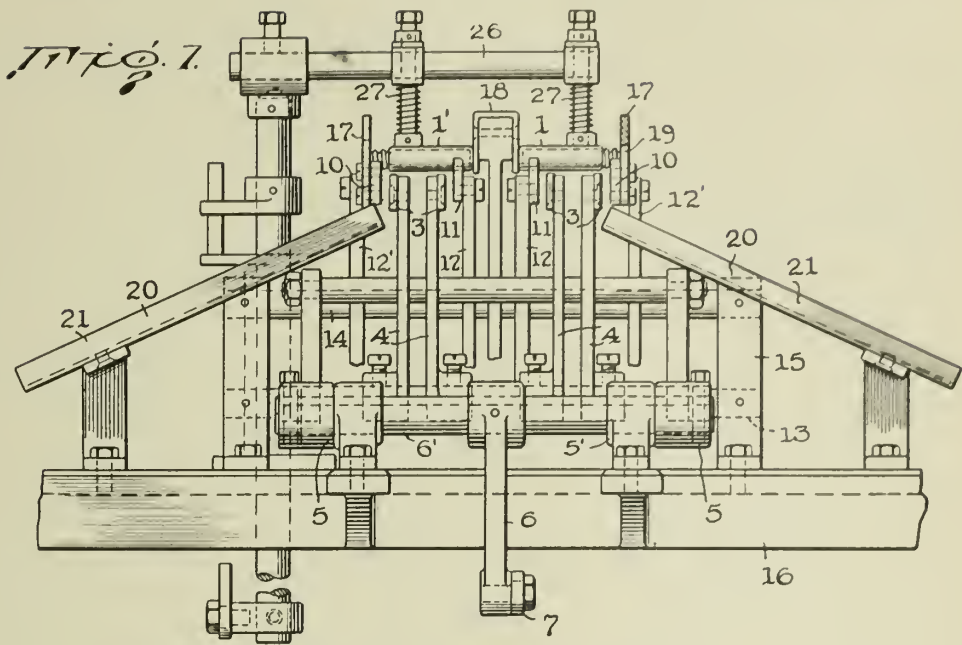
In Figs. 4 and 5 is shown still another form of the invention. The vials 28' are conveyed to the several gauging members or fingers 42' by mechanism similar to that illustrated in Fig. 3, that is, chain 29, and fingers 29', and they are supported on notched rack 41. Rod 41, slidable in bearing 41', is reciprocated by any suitable means, and supports at its upper end a two-armed bracket 42 on which are adjustably fixed gauging fingers 42'. It is to be understood that there is a plurality of pairs of fingers, each pair being spaced a distance differing slightly from the next adjacent pair. It is apparent that the first set of fingers, being spaced more closely than succeeding pairs, will tilt the oversize vials. The next set which are spaced a distance very little less than the desired diameter of the vial, will tilt those vials shaped to the required diameter but not the undersize vials. In this manner the vials are separated into the three groups mentioned.

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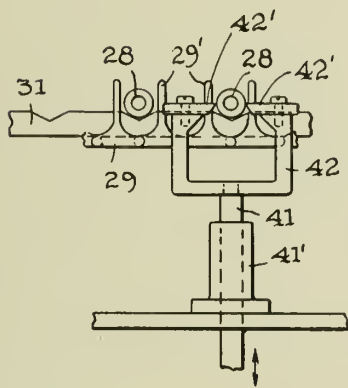
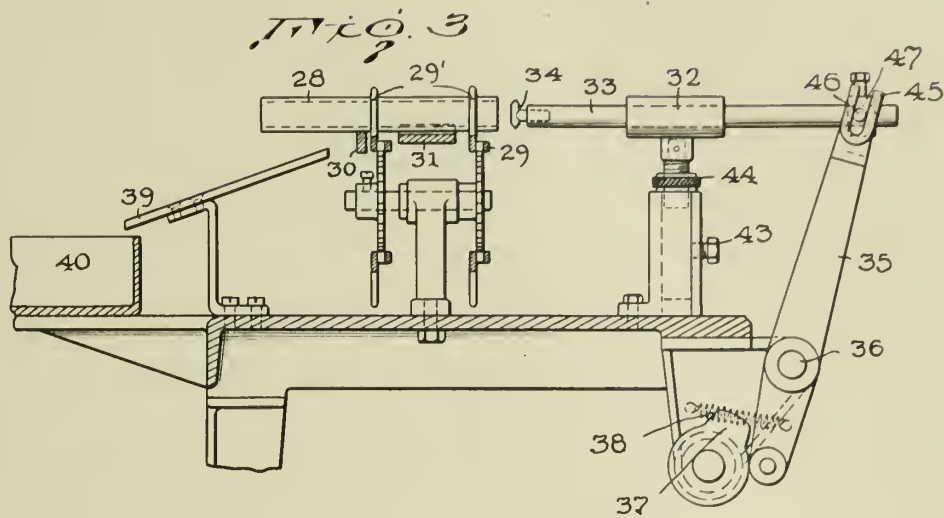
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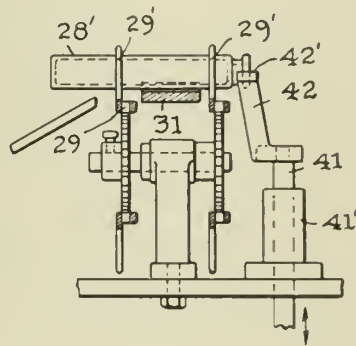
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2 Sheets-Sheet 2



*Fig. 4*



*Fig. 5*

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# ALIEN PROPERTY CUSTODIAN

## METHOD AND ARRANGEMENT FOR THE GENERATION OF ULTRA SOUND WAVES

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Application filed May 24, 1940

The invention relates to a method and an arrangement for the generation of ultra sound waves upwards from about 14000 vibrations per second by piezoelectric crystals or other ultra sound exciters. In the following description only piezoelectric crystals will mostly be mentioned as vibrators for simplicity sake, but all known ultra sound exciters, for instance also magnetostrictive sound emitters are meant.

Ultra sound vibrations can be generated in known manner in that piezoelectric crystals, for instance quartz plates, are excited by electric alternating fields to emit strong elastic vibrations. The intensity of such ultra sound vibrations as could be obtained up to the present is comparatively low and not sufficient for technical purposes. In order to obtain greater sound intensity, the crystals are made to vibrate in oil instead of in air. The greatest sound intensity is obtained in this manner up to the present at an electric efficiency of approximately 10 W./cm<sup>2</sup> crystal; also this sound intensity is however, still too low for practical technical purposes. For the application of ultra sound for the dry distillation of steel and for the production of alloys, for instance according to the Austrian patent 142,886 such energies are far from being sufficient. The sound radiation pressure in oil amounts at 10 W./cm<sup>2</sup> to only about 0.87 g/cm<sup>2</sup> and is not sufficient to radiate through greater masses.

The greatest loading of the crystal with 10 W./cm<sup>2</sup> up to the present as mentioned above is given by the limits of the loadability of the vibrating crystals. These limits depend on the disruptive strength of the crystal against high potential differences which break to pieces the vibrator.

The object of the invention is, to increase the energy of ultra sound waves in order to practically open for them the range of the technics. The invention consists substantially in placing under excess pressure a vibrator in liquid exerting a high insulating effect. Liquid exerting a high insulating effect means any liquid which is practically completely degasified and free from water, so that it opposes the highest possible resistance to the passage of current, such as transformer oil, paraffin oil, xylene, petrol ether; preferably very thin liquid liquids are employed. When practically carrying out the method the mounting of the crystal is carried, out according to the invention, so that it withstands excess pressure and the crystal is accommodated in a liquid exerting a high insulating effect such

as transformer oil, this liquid being under excess pressure. The height of the excess pressure is limited by that pressure of amplitudes and the corresponding dilatation at which the liquid begins to fume (critical pressure); further it is dependent on the strength properties of the material of the mounting, on the medium in which the crystal vibrates and on the maximum loading by the ultra sound waves tolerable for the treated substances. In order that higher potentials may be laid on the piezoelectric crystal, mosaic crystals which consist of crystal plates of similar frequency are employed which are enclosed between steel plates or other materials of corresponding density and of suitable electric conditions.

It is known, that sound waves can be guided by lens systems. In order to attain further increase of energy when the critical pressure of the liquid which is employed has already been attained, the sound radiated from the exciter is, according to the invention, concentrated by a lens system.

The sound intensity is expressed by the formula  $\frac{1}{2} \cdot I \cdot P$ . I is the highest speed of the vibrating particles and P their highest pressure. If then a piezoelectric crystal is put under pressure according to the invention, in that it is exposed in the mounting for example to a high mechanical pressure (oil pressure), the pressures of amplitude are increased linearly to this excess pressure. The P of the equation is thereby also increased and also the sound intensity of the vibrating crystal.

According to the invention it is possible to obtain sound intensities of substantially more than 10 W./cm<sup>2</sup>. Up to the present sound intensities of more than 100 W./cm<sup>2</sup> could be practically obtained. At 100 W./cm<sup>2</sup> the sound radiation pressure at a frequency of 300 Kilo-cycles amounts to 10 times those at 10 W./cm<sup>2</sup>, that is according to the number 8.7 g/cm<sup>2</sup> mentioned above. The pressure amplitude is at 10 W./cm<sup>2</sup> 5.12 atm. above atmospheric pressure and at 100 W./cm<sup>2</sup> 16 atm. above atmospheric pressure.

These high sound intensities can be obtained in the mounting itself. Outside the mounting the sound waves expand, when the substance to be treated is not put under pressure. If the substance is under pressure, the expansion is accordingly reduced and does not take place when the pressure is equal to the excess pressure under which the crystal vibrates; if it is higher or lower than the latter, a condensation or reduction of the amplitude pressures is attained.

Examples for carrying out the method according to the invention are diagrammatically illustrated in the accompanying drawing in connection with the degasification of steel or iron.

Fig. 1 shows the arrangement in section and Fig. 2 shows in section a modification of the arrangement shown in Fig. 1 partly broken off.

On a pedestal block 1 the mounting for the piezo-electric crystal 3 rests this mounting consisting of a steel casing 2. In this casing 2 the crystal 3 is placed between the electrodes 4, 5 by which the electric potential difference is pressed on, the mounting itself forming the electrode 5. The casing 2 is filled with oil and communicates with a conduit 6 which feeds and delivers the oil in the circulation under pressure, a cooling system 7 for cooling the oil in the conduit 6 being interposed. A thermostat 8 serves for maintaining the correct temperature of the oil, such as maximum 50°-60°, within the mounting, and a manometer 11 serves for the control of the pressure. The oil in the mounting is under excess pressure, for instance 25 at. On the electrodes 4 and 5 lies a potential difference of for instance 3-20 KV. By covering the vibration crystal with materials of suitable density and of suitable electric conditions the employment of higher potentials will become possible.

A block 12 is tightly mounted in the top of the casing 2 and serves for conducting the ultra sound waves to the material to be treated, the other end of this block 12 being connected, with this object in view, with the melting furnace, crucible or a heating ring 13. 14 designates the electric high frequency heating of the furnace. The conductive block 12 is preferably cooled by a cooling jacket 17, in order to obtain the required drop of temperature from the furnace up to the mounting, for instance from 1200° to 60°.

With the aid of the installation above described it is possible to lead by the vibrating quartz great sound intensities into the molten mass by means of which the dry distillation of the steel is effected.

In order to be able to lead the sound waves without loss and concentrically into the conductive block 12, i. e. to the molten mass to be treated, a lens system may be employed for guiding the sound waves from the quartz 3 to the block 12, as shown in Fig. 2. On the quartz 3 a condensing lens 15 is placed and a plano concave lens 16 is fixed on the foot end of the conductive block 12. The sound waves produced by the quartz vibrating under excess pressure are concentrated, as shown in the drawing, by the condensing lens 15 and intercepted and parallel directed by the lens 16, so that all sound waves get into the conductive block 12 and losses of sound waves by divergence are avoided.

In order that large quantities of steel and iron can be degasified, the treatment by sound waves can be carried out in the chill itself or the liquid steel flows through a trough of suitable shape and on to which the sound waves act from below. Also masses of molten metal may be treated by sound waves from below in containers in which the alloy is kept liquid. After a few minutes the mixture has progressed so far, that etched slide pictures scarcely allow to recognize the mixed crystals. High sound intensities are necessary also at the formation of the alloy in order that the greatest possible number of crystal germs are obtained in the solidifying molten mass. With high sound intensities also pairs of metal can be

mixed which up to the present were considered not to be mixable, for instance iron-lead, aluminium-cadmium, aluminium-lead, copper-lead, and zinc-lead. To produce such alloys the desired metal mixture, for instance, is brought in cold state into a crucible and then molten under the action of highly intensive sound waves. The higher melting metals are rapidly dissolved in the lower melting metal by the action of sound, as according to experience the metal mixture takes place spontaneously and uniformly in the molten mass.

Hereinafter other examples for the use of ultra sound waves will be given. By the strengthening of the sound energy which can be obtained according to the invention the proceedings influenced by ultra sound waves can be considerably accelerated.

When any dissolving proceeding is carried out, disturbances of equilibrium are caused by the introduction of the substances to be dissolved into a liquid. If for example lumps of salt are introduced highly concentrated solutions are formed which gradually diffuse through the liquid. If during the dissolving proceeding sound waves of high frequency are sent through the liquid, a uniform distribution of the phases occurs spontaneously, as by the sound waves the concentration is maintained uniform at all points. Dissolving proceedings under the action of ultra sound are therefore considerably accelerated. The sound waves detach further, when the sound pressure is sufficiently high, fine salt particles, distribute these uniformly in the liquid and thus make it possible to attain very rapidly the desired degree of concentration.

Precipitation proceedings also take place instantaneously quantitatively. Also reactions in the salt bath, such as for instance of metal oxides with carbon take place spontaneously, if during the reaction sound waves are propagated through the salt bath.

For the production of colloids it is possible to work with strong sound waves, which by their emulging force instantaneously form the colloid in finest distribution.

The sound waves tend to establish stable conditions, and for this reason a sharper separation of the products from distillation is obtained during the distillation proceedings, as the heat employed is rapidly distributed everywhere by the ultra sound waves and overheating or boiling delays are absolutely excluded. Premature cracking and other disagreeable disturbances reducing the yield are avoided.

Chemical reactions, transformations and so forth of liquid, solid, and gaseous substances rapidly take place under the action of sound waves, the main reactions being preponderant and secondary reactions are kept back. The speeds of the reactions are shortened to a fraction of the time. Different phases strongly act the one upon the other. By the property of the ultra sound waves to rapidly eject bubbles and to reduce the absorption coefficient gaseous phases are rapidly withdrawn from the reaction.

The invention may also be successfully used for increasing the reaction speed at the depoisoning of town gas. To remove from the coal gas the carbon oxide, which is well known for its poisonousness, the carbon oxide is oxidized by means of steam and hydrogen is thereby liberated, so that the heating value of the gas is the same before and after the treatment. To accelerate

the reaction one works with catalysts. Under the effects of highly intensive sound waves the reaction then takes place without pre-heating of the gas. Under ordinary circumstances the reaction takes place at about 450° to 500° C. Already a temperature of 30° C. is sufficient, to terminate in the shortest time the reaction under the influence of sound waves. Heating of the gas is generally not necessary.

Also reactions between liquids or between the three phases in general take place rapidly and without substantial increase of temperature.

By means of ultra sound waves physical-chemical and physical proceedings can be quite considerably accelerated. For instance when squirting liquid fuels into internal combustion engines, an instantaneous spraying of the fuel is obtained with the aid of the ultra sound vibrations, so that the thorough combustion to carbon oxide and steam takes place. In this instance the degree of efficiency of internal combustion engines is increased.

At the production of a fuel element the chief thing is, to obtain high reaction speeds. If at the production of these elements ultra sound waves with high sound intensities are employed, the potential is increased by one third owing to the pushing back of the polarisation.

At explosions taking place in a vessel closed on all sides, for instance in cartridge shells, infantry or artillery shot and shell, the combustion of the explosive substances takes place in such a manner that first a uniform combustion takes place and only after the occurrence of explosion waves the spontaneous combustion sets in. If the explosion is carried out under the influence of sound waves which correspond to the wave length of explosion waves, the combustion is explosive from the beginning. The pressures produced thereby are more than one third above the normal explosion pressure. Also the distant ignition of mines and explosive substances can be carried out with ultra sound waves.

Gas reactions carried out in sound fields, in which catalysts are employed, accelerate the reactions and cause the desired states of equilibrium and therewith the chief formation of the desired substances.

At electrolytic proceedings ultra sound waves may serve for the reduction of the polarisation. Under the effect of ultra sound, bodies may be altered permanently or temporarily as regards their mechanical and electric properties, so that they better correspond to the desired objects of use, for instance the electric insulating or conducting capacity can be increased.

With ultra sound waves mechanical and thermic effects can also be obtained. Ultra sound vibrations owing to their degasifying effect ventilate water and, as besides they uniformly distribute the heat or cold, ultra sound is employed with advantage at the production of ice. The production of ice is then more rapid and the ice which is produced and is free from air, is absolutely transparent, which is usually not the case as the air enclosed in the ice block leaves behind a non-transparent core. Especially in glass smelting operations for the production of optical lenses this degasifying is of technical importance. With ultra sound it is possible to remove dust from gases. The treatment with sound waves is further suitable at the refinement for instance flotation of mineral substances and also for the shaking out of solid substances from liquid. Also the examination of materials as regards their mechanical properties and quality (finding out of defects in material and fatiguing phenomena of solid substances) can be carried out with ultra sound waves. Under the influence of high frequency sound waves it is further possible to atomize solid substances, the splitting according to crystal surfaces may be easily made possible by other mechanical treatment.

Finally, biological effects can be obtained with ultra sound waves. Bacteria and ferments may, for instance, be killed and destroyed; this can be carried out in such a manner, that gases suitable herefor absorbable in the treated liquid are introduced, if necessary under pressure, whereupon the reaction takes place with treatment by sound and degasification of the liquid so that a degerming, depoisoning and refining of the liquid, for instance of milk or fruit juice, is obtained.

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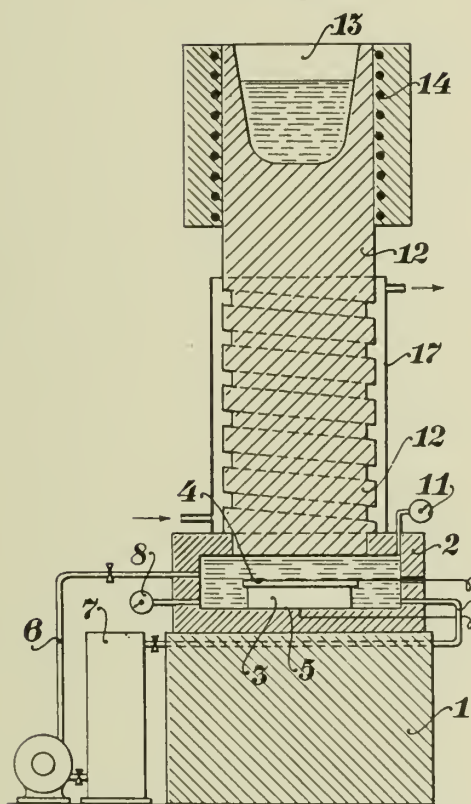


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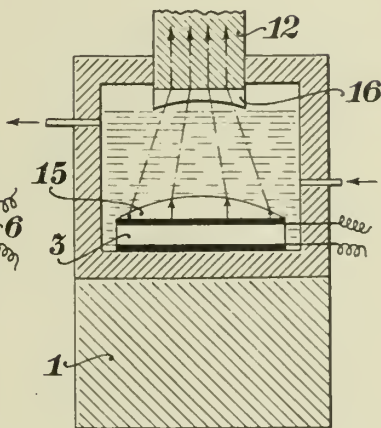
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*Fig. 1*



*Fig. 2*



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# ALIEN PROPERTY CUSTODIAN

## METHOD OF TELEGRAPHICALLY TRANSMITTING COMMUNICATION FOR STATISTICAL PURPOSES

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This invention relates to a method of telegraphically transmitting communications for statistical purposes.

It is well known in the art to employ the usual telegraph codes, for instance, the five-unit code for the telegraphical transmission of communications for statistical purposes. The known apparatus present, however, the drawback in that special devices for the transmission and reception of the code combinations must be contrived which scan the record cards at the transmitting station, translate the records thereof into code combinations and directly determine the records of the cards at the receiving station on the basis of the code combinations received.

The branch offices of large industrial undertakings have, for instance, to deal with a certain amount of statistical data, for which it would, however, not pay to employ a complete equipment for perforating record cards for statistical purposes. In such cases, it has hitherto been usual to employ in a branch office at least a perforating machine and to send the record cards thus punched by mail to the head office. Another method consists in telegraphically transmitting the communications to the head office. Both methods are, however, very time absorbing.

The object of the present invention is to provide a method, whereby the standard tele-printers available, for instance, in the public tele-printer system may be employed to transmit statistical data. This method consists in transmitting the data from a standard tele-printer transmitter in the form of code combinations and then in transmitting the same to a translator at the receiving station after having been translated by a tele-printer receiver, said translator controlling a perforating machine for the production of record cards.

Further details of the invention will be apparent from the following description taken in connection with the accompanying drawings, in which Figs. 1 to 3 are schematical representations of systems for transmitting communications for statistical purposes.

Fig. 4 shows a circuit diagram of the electrical connections of a perforating machine and a tele-printer as employed in the system shown in Fig. 1.

Fig. 5 shows the manner in which a perforating machine is controlled by a translator of the special type, and in which the translator is controlled by a perforator tape on which are punched the code combinations of the usual telegraph codes.

by depressing the keys of the keyboard of the tele-printer FS (Fig. 1) and then over the long-distance line FL to the tele-printer receiver FE serving as a translating device for the impulse transmitted from the tele-printer to the perforating machine, the translating device controlling the card perforating machine KL through the line VL. By the method according to the invention a card perforating machine for the production of record cards need be employed only at the head office, where the record cards are utilized for statistical purposes. At the head office, for instance, of a large industrial undertaking, the statistical data transmitted during the slack period from the branch offices are received and punched on the record cards which may later be utilized for statistical purposes. It is then left to the discretion of the head office as to whether the latter sends back in any suitable manner the result of the various records of the data punched on the cards to the branch offices.

The simple arrangement as shown in Fig. 1 presents certain difficulties, since the standard card perforating machines cannot operate so rapidly as the tele-printer receiver is capable of receiving communications. Furthermore, the communications received by the tele-printer receiver are composed of such which only serve for the exchange of intelligence and of such which also contain statistical data. It is therefore desirable that the tele-printer receiver and the card perforating machine should not operate simultaneously, but as far as possible independently of each other.

This may be accomplished by employing the arrangements as shown in Figs. 2 and 3. As shown in Fig. 2 the communications are transmitted from the tele-printer transmitting apparatus FS over the long-distance line FL to the tele-printer receiving apparatus FE designed in the form of a receiving perforator or is combined therewith. The perforated tape produced in the receiving perforator is fed to a perforated tape transmitter LS which in turn controls a translator US. The latter translates the signals of the telegraph code into the control operations of the machine for perforating the record cards. The arrangement as shown in Fig. 2 may be simplified. The perforated tape of the receiving perforator EL (Fig. 3) is directly fed to the translator US provided with a scanning device for the code combinations of the perforated tape and which controls the card perforating machine in accordance with the code combinations.

The upper portion of Fig. 4 designated by FE

In transmitting statistical data, the text is sent

illustrates eighteen contacts  $zk_1$  to  $zk_{18}$  controlled by the pull rods of the tele-printer in the manner, for instance, as described in the German Patent No. 588,641. Below the designation of the contacts, are indicated in parenthesis the signals of the telegraph code allotted to the corresponding pull rods. In the lower portion of Fig. 4 is schematically shown a card perforating machine KL of the usual type. Such perforating machines are disclosed in the German Patent 587,155 and provided with a keyboard as shown in Figs. 8 to 10 of the last-named patent. The keys of the perforating machine may therefore be operated by magnets designed, for instance, in the form of solenoids and denoted in Fig. 4 by the reference characters  $LM_1$  to  $LM_9$ ,  $LM_{12}$  to  $LM_{14}$ ,  $LM_{leer}$  (space bar key),  $LM_{tab.}$  (tabulator key) and  $LM_s$ . These magnets actuate the corresponding keys. To energize the perforating machine from the tele-printer, the energizing circuit of the driving motor KM shown at the right is employed, in which is included a relay MR with the contacts  $mr_1$ ,  $mr_2$  and  $mr_3$  and a relay U with the contact  $u_1$ .

The operation of the arrangement is as follows: To transmit statistical data, the letter group of the five- or six-unit code is not employed. If during the transmission of statistical data signals of the letter group are received, the perforating machine is not simultaneously operated with the tele-printer. If the figure shift combination is transmitted by the tele-printer FS (Fig. 1), the figure shift combination is translated by the tele-printer FE and actuates the pull rod allotted to the contact  $zk_{13}$ . The contact  $zk_{13}$  is closed in the manner as described in the German patent 588,641; the code combination allotted to the signal "(" is then transmitted so that the contact  $zk_{15}$  is closed in the same manner. During the transmission of these two code combinations the following circuit is established; —, relay MR, closed contact  $zk_{15}$ , closed contact  $zk_{13}$ , +, whereby the relay MR is energized to close the contacts  $mr_1$  to  $mr_3$ . The circuit of the motor KM is closed by the contact  $mr_3$ . The contact  $mr_1$  connects the negative pole of the battery to one terminal of each of the magnets LM. Through the contact  $mr_2$  a holding circuit is closed for the relay MR, which circuit is from +, contact  $u_1$ ,  $mr_2$ , relay MR to —. The relay remains therefore energized till the contact  $u_1$  is actuated in the manner as hereinafter described upon the disconnection of the perforating machine. The text to be punched on the cards by the perforating machine is now transmitted from the tele-printer FS (Fig. 1) through the long-distance line FL. Upon the closure of the pull rod contact  $zk_3$ , the magnet  $ML_1$  is, for instance, energized and the key I of the perforating machine is depressed, so that a corresponding hole is punched into the card. The other magnets of the perforating machine are controlled in a similar manner.

If a new card is to be inserted, the signal WR (carriage return) is transmitted from the tele-printer, thereby actuating the pull rod contact  $zk_{16}$ . In this manner, the magnet  $LM_s$  of the perforating machine is again actuated so that also the carriage of the perforating machine returns to its initial position and the punches are brought into the position of rest. A new card is inserted from the card receptacle. Also a perforating machine of the standard type may be controlled in the manner just described by tele-printers of the standard type,

in which case only the tele-printer FE at the receiving station shown in Fig. 1 is to be provided with pull rod contacts as shown in Fig. 4 so as to form a translating device.

The perforating machine is disconnected upon the reception of the signal "letter shift" (Bu). The contact  $zk_{14}$  is actuated, thus opening the circuit of the relay U. The contact  $u_1$  is opened, thus deenergizing the relay MR. The motor is disconnected and the magnet LM is deenergized. Under this condition, a normal text not serving for statistical data may be received on the tele-printer FE. Of course, the connection and disconnection of the driving motor of the perforating machine may also be made conditional upon other code combinations and under circumstances upon a considerable number of code combinations in order to prevent the perforating machine from being operated in the event of an accidental transmission from the tele-printer.

This embodiment is adapted for open-circuit operation so as to enable an alarm signal to be transmitted to the remote transmitter in the case of disturbances occurring in the receiving system, for instance, in the perforating machine. This may, for instance, be accomplished by interrupting the working current of the line at the receiving station, in case control contacts or other control devices are caused to operate. Such control devices may be designed in a manner similar to that described in connection with the following embodiment.

As mentioned above, the perforating machine must, according to the arrangement as disclosed in the embodiment shown in Fig. 4, be continuously connected to the tele-printer as long as there is a possibility that statistical data be received which are to be recorded by the perforating machine. Furthermore, in the case of a normal line speed, difficulties are presented as regards the control of the return motion of the carriage of the perforating machine. If the tele-printer receiver, for instance, in the case of a perforated tape transmission receives the statistical data at full speed, the tele-printer carriage returns during the transmission of two code combinations, i. e. "carriage return" and "line feed", which last about 280 millisecc. Other signals follow immediately. Such a speed would entail a change in the standard perforating machine. Both difficulties may be removed when employing the embodiment as shown in Fig. 5 which corresponds to the arrangement as illustrated in Fig. 3.

The tele-printer receiver Fig. 3 is equipped with a receiving perforator which is preferably combined therewith. Such apparatus are, for instance, described in the article by Wüsteney "Lochstreifengeräte für Fernschreibmaschinen" in the "Zeitschrift für Fernsprechtechnik, Werk und Gerätebau" 1933, Vol. 3, Fig. 9, so that a description of the operation is therefore not deemed necessary. Among the various functions of this tele-printer receiver the most important consists in that the connection and disconnection of the receiving perforator, with the tele-printer receiver in operation, are effected in accordance with the reception of the figure and letter shift combination. To this end, for instance, the pull rod allotted to the figure shift combination controls also a system of levers which mechanically connects the perforating machine. A system of levers pivotally mounted on the pull rod allotted to the letter shift com-

bination serves to disconnect the perforating machine. The transmission of impulses by these systems of levers may, of course, also be effected in accordance with the motion of the carriage which in the embodiment just described is raised and lowered when shifting the type groups.

By designing the tele-printer receiver and the receiving perforator in such a manner, only the signals of the figure group are punched into the paper tape, whereas the signals of the letter group are suppressed. The perforated tape thus produced in the receiving perforator selects from a communication the text which is not utilized for producing records on the cards. The tele-printer receiver may receive signals, with the perforating machine disconnected, and the perforated tape may later be utilized to produce record cards.

The translator US is shown in Fig. 5 at the left and is designed in principle as is, for instance, disclosed in the German patent No. 650,851 in connection with telegraphic apparatus for the facsimile transmission of characters. In this patent is described an arrangement in which selector bars are displaced when a perforated tape is being scanned, which bars bring a contact lever into engagement with a revolving transmitter drum. The translating device US is designed on the above principle; however, the cam is given another shape. The cams NS1 to NS27 are given the form as shown developed in Fig. 5 at the left. A control lever for the cam contacts  $nk_1$  to  $nk_{27}$  with the exception of  $nk_1$ ,  $nk_{17}$  and  $nk_{18}$  is selected by the selector bars of the translator. The cam contact  $nk_1$  is the control contact, where as all other contacts  $nk_2$  to  $nk_{27}$  with the exception of  $nk_{17}$  and  $nk_{18}$  are preparing contacts which are closed by the cams. The contacts  $nk_{17}$  and  $nk_{18}$  are closed upon each complete rotation by the corresponding cams NS17 and NS18. They serve as hereinafter described to perform control functions. The final closure of the corresponding circuit is, however, effected through the control contact  $nk_1$ . The contacts  $nk_2$  to  $nk_{11}$  are allotted to the figures 1 to 9 and 0, whereas the other contacts  $nk_{12}$  to  $nk_{27}$  are provided for special functions. The purpose of these contacts will be hereinafter pointed out in connection with the description of the operation of the translator, in which also the other relays and contacts shown at the left of Fig. 5 will be dealt with.

In Fig. 5 at the right is shown the perforating machine. The latter is based upon the construction shown in the German patent No. 587,155. It is provided with sixteen magnets LM1 to LM16, of which the magnets LM1 to LM10 correspond to the numbers 1 to 0 and operate the corresponding punches of the perforating machine. The other magnets have special functions to perform. The perforating machine may also be operated in the usual manner from the keyboard. To this end, a change-over switch U is provided with contacts UI to UIV. In the position of the changeover contacts, shown, the perforating machine is adjusted for automatic operation. It is changed over by the keys T1 to T15. The numbers 1 to 12 are punched with the aid of the keys T1 to T12. Furthermore, special keys are employed for the production of additional perforations. T13 is the tabulator key, which when depressed, causes the carriage to advance by a plurality of spaces until it is prevented by a stop; T14 is the space key and when the key T15 is de-

pressed, the card is punched, the carriage is caused to return and the punches are restored. The punched card is discharged and a new card is inserted.

If signals arrive over the long-distance line FL (Fig. 3) only the signals of the figure case are utilized for statistical purposes and punched into the tape by the receiving perforator machine. This perforated tape is fed to the translator US and actuates there the combination bars substantially in the manner as described in the German patent No. 650,851. In utilizing the impulse combinations for the number 1 punched into the perforated tape and which are composed according to the five-unit code of  $+++-+$ , the control lever for the contact  $nk_2$  is selected by the combination bars. During the rotation of the translator shaft with the cams NS1 to NS27 the following circuit is established: +battery, contact UIV, contacts  $nk_1$ ,  $nk_2$ , magnet LM1,  $wk_1$ , -battery. The armature of the magnet LM1 of the perforating machine is attracted and presses the punch allotted to the number 1. Accordingly, it causes the carriage of the perforating machine to advance one space. This process is repeated each time a code combination for the numbers 1 to 0 is transmitted. If the combination "space" is transmitted from the tele-printer, the contact  $nk_{24}$  is closed, thus operating the magnet LM14 which advances the carriage of the perforating machine by one space without causing a punching of the card.

To control the position of the carriage of the perforating machine, control contacts  $wk_1$  and  $wk_2$  are provided which are actuated by the carriage in its end position. In the initial position, the contacts  $wk_1$  and  $wk_2$  are operated. In Fig. 5 the contacts are shown in the position which corresponds to the initial position of the carriage. The function of the contacts will hereinafter be explained.

The punching of a complete card corresponds to a line printed on the page printer which prints the text. If the code combination "carriage return" is transmitted, the carriage of the tele-printer returns to its initial position, whereas this code combination is not utilized in the perforating machine for statistical purposes. If immediately thereafter the code combination "line feed" is transmitted to the page printer, the roller of the page printer is advanced by one line and the contact  $nk_{25}$  of the translator is closed. In the end position of the carriage a circuit for the magnet LM16 which controls the punching of the record card is established: +battery, UIV,  $nk_1$ ,  $nk_{26}$ , closed contact  $wk_2$ , UIII, LM16, -battery. The magnet LM16 causes the punching mechanism of the perforating machine to be released. The magnet is preferably so designed that it releases the coupling for the punching shaft of the perforating machine in order that a complete rotation may be effected. During this rotation the card is punched in accordance with the punches previously set and then the card is discharged and a new one is inserted.

Shortly after the punching, the coupling of the perforating machine for causing the carriage to return is released by the magnet LM15, thus bringing the carriage back into its initial position. This may be effected by the closure of the following circuit: +battery, UIV, UII, contact  $kwr$ , which is closed by the cam NWR, magnet LM15, -battery. During the return motion of the carriage, the locked punches of the perfo-

rating machine are unlocked and caused to return to the initial position. During the return motion of the carriage of the perforating machine and during the punching operation of the record card, the feed mechanism for the perforated tape arranged on the translator US is stopped. This is effected by the locking magnet SPF in the following manner:

The relays B and D are connected in parallel to the magnet LM<sub>16</sub>. Upon the energization of the locking magnet LM<sub>16</sub>, the following circuits are closed: +battery, UIV,  $nk_1$ ,  $nk_{26}$ ,  $wek_2$ ,  $b_3$ , B, -battery and +battery, UIV,  $nk_1$ ,  $nk_{26}$ ,  $wak_2$ ,  $d_3$ , D, -battery, thereby operating the relays B and D, when the carriage is in the end position. The contacts  $b_2$  and  $d_2$  as well as  $b_3$  and  $d_3$  are changed over by the relays B and D. The contacts  $b_2$  and  $b_3$  as well as  $d_2$  and  $d_3$  are, however, designed in the form of make-before-break contacts; i. e., the contacts  $b_2$  and  $d_2$  change over sooner than  $b_3$  and  $d_3$ . Their corresponding relays B and D remain therefore energized through the closed contact  $wak_1$  and the card control contact  $kk$ . The circuit for the relay D is from: -battery, relay D,  $d_2$ ,  $wak_1$ , UIV to +battery; for the relay B from -battery, relay B,  $b_2$ ,  $kk$ , UIV, to +battery. Upon the closure of following circuit: -battery,  $b_1$ , and  $d_1$ , SPM, +battery, the locking magnet SPM is energized. The magnet SPM is so arranged on the perforated tape scanning device of the translator US that its armature locks the feed mechanism for the perforated tape.

If the operator at the tele-printer FS (Fig. 3) has erred, the signals of the line or card hitherto received must be cancelled. To this end, the key "?" is depressed and the signals "carriage return" and "line feed" are transmitted and the entire line is repeated. The selector bars of the translator are so notched that upon the transmission of the signal "?" two contact levers, i. e., the contact levers for the contacts  $nk_{25}$  to  $nk_{27}$  come into engagement therewith. Upon the actuation of the contact  $nk_{25}$  the following circuit is established: +battery, UIV,  $nk_1$ ,  $nk_{25}$ , LM<sub>15</sub>, -battery, whereby the magnet LM<sub>15</sub> is energized to release the coupling of the perforating machine so as to permit the carriage to return. The carriage is pulled back and the punches are unlocked, thereby restoring the punches hitherto set. Upon the actuation of the contact  $nk_{27}$  the following circuit is established: +battery, UIV,  $nk_{27}$ , A, -battery, whereby the relay A is energized, so that the feed mechanism for the perforated tape is locked in the manner as mentioned above. By the following combinations "carriage return" and "line feed" transmitted immediately thereafter, the carriage of the page printer is caused to return, thereby causing the roller to advance in the above-described manner.

Upon the occurrence of faults there results in most cases a false position of the carriage of the perforating machine. After completion of a line, it may happen that the carriage has been advanced more or less a space. These faults may be made evident by employing control devices which indicate the position of the carriage. In this case the following conditions must be fulfilled:

(1) If the combination "line feed" is transmitted before the carriage reaches its end position, the punching magnet LM<sub>16</sub> should not be energized and the locking magnet SPM must stop the perforated tape.

(2) In the end position of the carriage only

the code combinations "line feed" or "error (?) " should be received, since the reception of other code combinations cannot take place in this position. If other code combinations should therefore arrive at this moment, the perforated tape must also be stopped by a locking magnet.

(3) If the code combination "error" arrives, the carriage of the perforating machine is brought back into its initial position and the punches previously set are unlocked. When unlocked, the code combinations "carriage return" and "line feed" must be transmitted in order that the page printer begins a new line. The carriage of the perforating machine is, however, in the initial position. Care should therefore be taken to see that the locking magnet SPM is not operated in response to the code combination "line feed".

The above requirements are met by the following arrangement.

The position of the carriage is controlled by the contacts  $wak_1$ ,  $wak_2$ ,  $wek_1$  and  $wek_2$ . The contacts  $wek_1$  and  $wek_2$  are contacts which are open in the initial position of the carriage but are closed in all other positions. In the circuit diagram is shown the initial position of the carriage. The contacts  $wek_1$  and  $wek_2$  are, in the position shown, in all positions of the carriage except in the end position. When the carriage reaches its end position, the contacts are changed over.

If the case under (1) occurs, i. e., if the code combination "line feed" is transmitted before the carriage reaches its end position, the contact  $wek_2$  is open and  $wak_2$  closed. By the closure of the following circuit: +battery, change-over switch UIV, control contact  $nk_1$ , contact  $nk_{26}$ ,  $wak_2$ ,  $d_3$ , D, -battery, the relay D is caused to operate, thus energizing the locking magnet SPM and stopping the perforated tape. To eliminate the trouble, the operator must remove the perforated tape and insert it in such a manner as to enable the punches to be set again. Furthermore, the carriage of the perforating machine must be brought back into its initial position. The armature of the relay D then drops upon the actuation of the contact  $wak_1$  to the open position, thus deenergizing the locking magnet.

If in the end position of the carriage as mentioned under (2) another impulse combination is received instead of "line feed" or "?", the F-relay which has a relatively high-ohmic coil is inserted in the circuit in series with the corresponding punching magnet of the perforating machine through the changed-over contact  $wek_1$ . The coil of the relay F is so proportioned as to prevent in this case the punching magnet from being operated. The relay F remains energized through its contact  $f_1$ , thus energizing the locking magnet SPM through its contact  $f_2$  so that also in this case the perforated tape is prevented from advancing.

As mentioned above, the carriage of the perforating machine is brought back into its initial position when the code combination "error" is transmitted and immediately thereafter the code combinations "carriage return" and "line feed" for the page printer are transmitted. In the initial position of the carriage, the contact  $wak_2$  is now open so that the incoming combination "line feed" cannot act upon the perforating machine owing to the contacts  $wak_2$  and  $wek_2$  being open. In this manner the card not punched is prevented from being discharged from the perforating machine.

To control the proper feed of the cards, the

card control contact *kk* is provided. When inserting a new card, the card control contact arranged on the punching plate of the perforating machine is momentarily opened to release the armature of the relay B. Consequently, if the supply of cards is interrupted owing to a trouble in the card receptacle or in the card supply channels, the B-relay remains energized and the armature of the locking magnet prevents the perforated tape in the translator US from advancing until the trouble is removed.

Finally, an arrangement for controlling the punching is provided. Should, for instance, the coupling of the punching shaft fail to operate so that the latter is not stopped in the zero position, but continues to rotate, the A-relay is continuously supplied with current impulses through the coupling control contact *kkk*. The latter is continuously actuated by a cam NKK during the rotation of the punching shaft so that the A-relay is thereby supplied with current impulses through the following circuit: —battery, relay A, coupling control contact *kkk*, UIV, +battery. The locking magnet is energized through the contact *a<sub>2</sub>*, since the relay A remains energized during the momentary interruptions of the contact *kkk*, thus preventing the perforated tape from advancing.

If the transmission over the long-distance line FL is interrupted, the translator US uses up the reserve of perforated tape and the perforated tape becomes stretched. In this manner the control contact *lkk* allotted to the perforated tape is closed so that the relay A is again operated through +battery, UIV, *lkk*, relay A, —battery and the perforated tape is again prevented from advancing until *lkk* is again opened.

To control the reserve of cards in the receptacle, a receptacle control contact *mkk* is provided for the card receptacle M. If the receptacle is empty, the contact *mkk* is closed, thus establishing the following circuit: +battery, UIV, *mkk*, A, —battery, thereby energizing the relay A so that the perforated tape is again prevented from advancing.

In the record card system, so-called additional perforations are provided as already mentioned above for certain purposes. The additional perforations serve to enable a card to be punched for the registration of a larger amount of statistical data and consist in the fact that a plurality of holes are punched in one column. Any figure from 1 to 9 may be provided with an additional perforation 0, 11 or 12. The additional perforation 0=30, the additional perforation 11=20 and the additional perforation 12=10. If, for instance, in any column of the record card, the figures 5 and 0 are punched this means 5+30=35. If the additional perforations 0, 11 or 12 appear alone in a column they mean 0, 11 or 12. When perforating by hand, an additional perforation is produced on the card by the simultaneous depression of two keys. Should this method be employed for the present invention, the teleprinter would require  $3 \times 9 = 27$  combinations, since each additional perforation would have to be combined with the other figures 1 to 9. The combinations for the additional perforation and the corresponding figures are therefore transmitted one after the other. The carriage of the page printer and perforating machine must then be prevented from advancing.

Devices for preventing the carriage of the page printer from advancing in the case of certain code combinations are well known in the art; for instance, such as are employed in page printers

for printing accents. In such printers, the accents are arranged in the figure case of the letters F, G and H. By the use of such devices for producing the additional perforation the above-mentioned conditions for the page printer may therefore be fulfilled. On the type-bars of the teleprinter, types differing from the accents may naturally be employed for producing the additional perforation.

The control of the perforating machine is effected in the following manner: When transmitting the figure 0, i. e., without additional perforation, a cam contact *nk<sub>11</sub>* is closed to energize the punching magnet LM<sub>10</sub>. The normal perforation 0 is produced. During the translation of the code combination, figure case F of the telegraph code, corresponding to the additional perforation 0, two cam contacts *nk<sub>12</sub>* and *nk<sub>13</sub>* are operated. The selector bars of the translator are correspondingly notched. Upon the actuation of the contact *nk<sub>12</sub>* the following circuit is closed: +battery, UIV, *nk<sub>11</sub>*, *nk<sub>12</sub>*, LM<sub>10</sub>, —battery, thus causing the magnet LM<sub>10</sub> to operate again. The contact *nk<sub>13</sub>* closes the circuit for the relay R: +battery, UIV, *nk<sub>11</sub>*, *nk<sub>13</sub>*, R, —battery. The contacts *r<sub>1</sub>* and *r<sub>2</sub>* are actuated to the closed position. The relay R remains energized for a complete rotation through the contact *r<sub>1</sub>*. The circuit is from —battery, relay R, contact *r<sub>1</sub>*, *nk<sub>18</sub>*, *nk<sub>17</sub>*, UIV to +battery. The magnet LM<sub>10</sub> is maintained energized for a period corresponding to two rotations. The circuit is from: +battery, UIV, *nk<sub>17</sub>*, *r<sub>2</sub>*, LM<sub>10</sub> to —battery. Consequently, the carriage is prevented from advancing in the perforating machine. In the meantime the following character is set on the translator so that during the next rotation the contact is closed and the character is set on the perforating machine without there occurring a displacement of the carriage. At the end of the second rotation of the cam shafts NS, the contacts *nk<sub>17</sub>* and *nk<sub>18</sub>* are brought into the open position, thus deenergizing both the relay R and the magnet LM<sub>10</sub>. Shortly afterwards, also the contact *nk<sub>11</sub>* is opened, thus deenergizing the magnet LM which had set the second punch, whereupon the carriage of the perforating machine advances. The other additional perforations are effected in a similar manner with the aid of the relays S and V and the corresponding contacts *nk<sub>15</sub>*, *nk<sub>16</sub>* and *nk<sub>20</sub>*, *nk<sub>21</sub>* respectively. In this case the magnets LM<sub>11</sub> and LM<sub>12</sub> are energized.

When the perforated tape is fed directly from the receiving perforator EL to the translator US and stretches between the former and the latter, it may happen that it is stopped by the contact *lkk* within the interval elapsing between the combination allotted to an additional perforation and the next following code combination. In this case the perforated tape is not prevented from advancing, since the cams NS continue to rotate and the magnet LM is maintained only energized for one rotation for producing the additional perforation. In this case two further cams NS<sub>22</sub> and NS<sub>23</sub> are provided which just bridge the gaps of the cams NS<sub>17</sub> and NS<sub>18</sub>. These cams control two contacts *nk<sub>23</sub>* and *nk<sub>24</sub>* arranged parallel to the cam contacts *nk<sub>17</sub>* and *nk<sub>18</sub>*. The control levers for the contacts *nk<sub>22</sub>* and *nk<sub>23</sub>* come then into engagement with the selector bars of the translator US in the event of the code combination — — — — being set. This code combination will, however, be set if the perforated tape is stopped. When the perforated tape is prevented from advancing within the interval elapsing be-

tween the code combination "additional perforation" and the next following combination, the magnet  $LM_{10}$  and the relay  $R$  are therefore supplied with permanent current so that an error cannot occur. The same process is repeated for the code combination of the other additional perforations in connection with the magnets  $LM_{11}$  and  $LM_{12}$ .

If the change-over switch  $U$  is changed over no remote-control functions occur and the perforating machine is operated in the manner as is usual in record card systems.

In the lower portion of Fig. 5 are shown, furthermore, the supply circuit and the motors. The motor switches  $Sch_1$  and  $Sch_2$  may, of course, be remote controlled as is usual in connection with tele-printers.

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PUBLISHED

MAY 18, 1943.

BY A. P. C.

B. GALSTER ET AL  
METHOD OF TELEGRAPHICALLY TRANSMITTING  
COMMUNICATION FOR STATISTICAL PURPOSES  
Filed May 27, 1940

Serial No.

337,460

3 Sheets-Sheet 1

Fig. 1

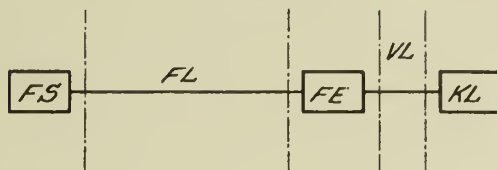


Fig. 2

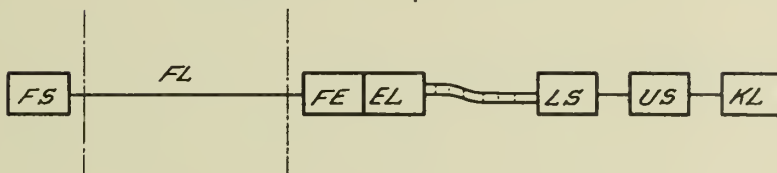
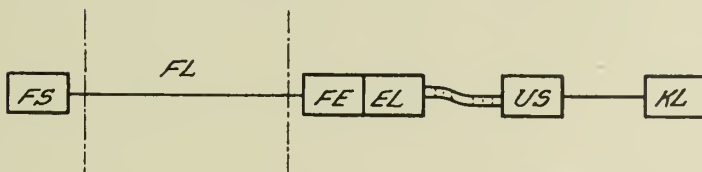


Fig. 3



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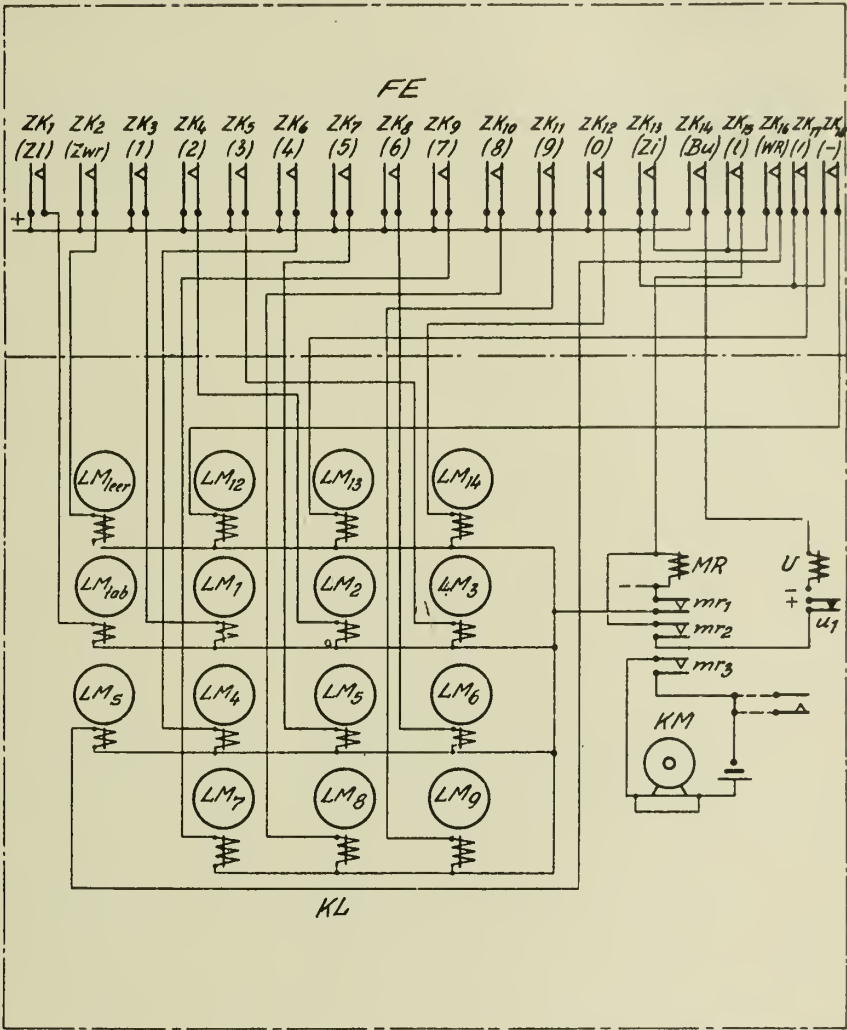
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3 Sheets-Sheet 2

Fig. 4



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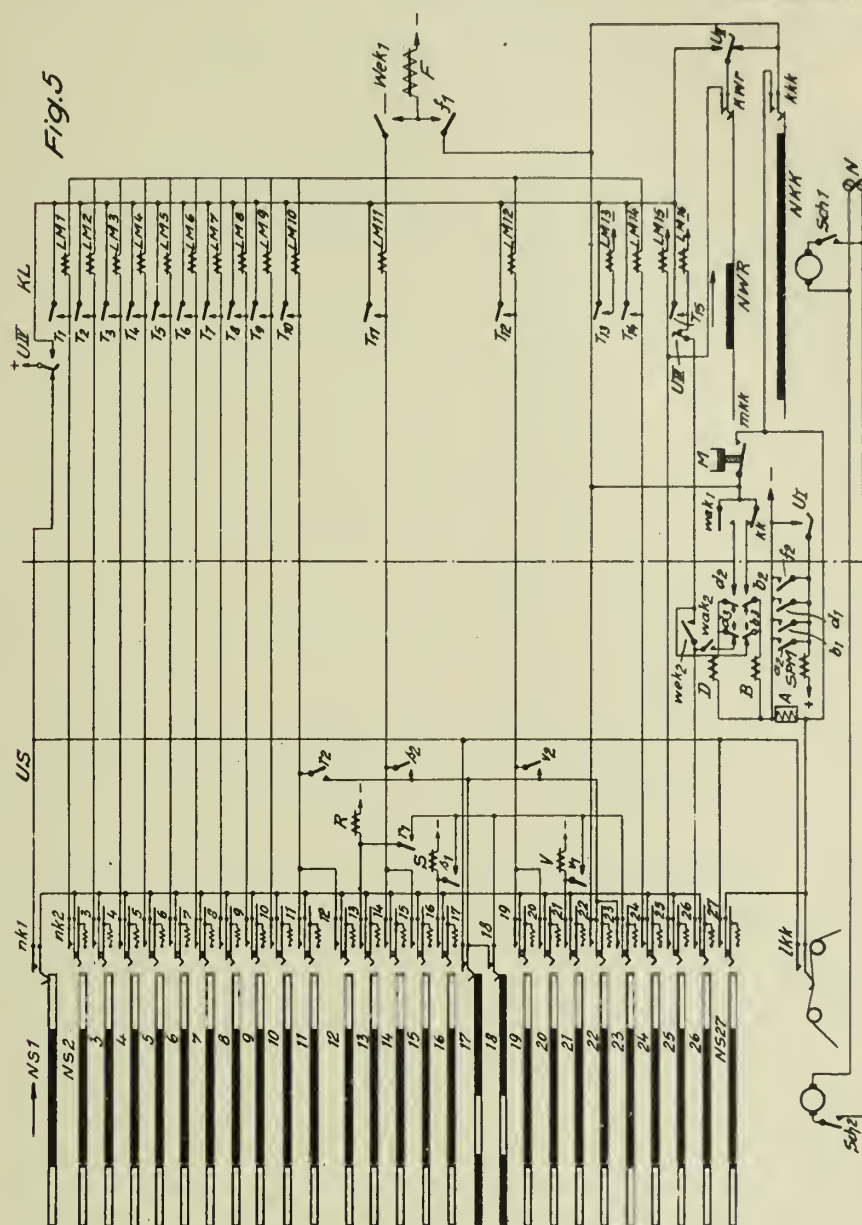


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3 Sheets-Sheet 3



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# ALIEN PROPERTY CUSTODIAN

## DEVICE FOR FASTENING THE SHANK OF A PROPELLER BLADE

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Application filed May 29, 1940

The invention has for one of its objects the provision of means for fastening propeller blades particularly wooden ones to metallic mountings and is more particularly adapted to be used in connection with aerial propellers having either constant or variable pitch.

The invention permits of attaining, in a very simple manner, a high compression of the wood within the socket or metallic sleeve, that is a wedging capable of avoiding the occurrence of shocks in the assembly, the latter of which being further capable of resisting without danger considerable centrifugal stresses to which such assemblies are normally subjected.

It is another object of the invention to form the interior of said metallic socket in the shape of a truncated cone, the large base of which is situated opposite the extremity of the propeller blade to be fastened.

It is yet another object of the present invention to turn the shank of the blade to a cylindrical or conical form adapted to enter the narrowest part of the socket.

It is still a further object of the present invention to provide a preferably circular wedge (or portions of such wedge) made of wood or of plastic material adapted to be forcibly inserted between said socket and said shank of the blade, said wedge being suitably shaped and previously coated with glue, a special cement, or any other suitable binding agent.

This invention accordingly consists in the features of construction, combination of parts and in the unique relations of the members and in the relative proportioning and disposition thereof; all as more completely outlined herein.

To enable others skilled in the art so fully to comprehend the underlying features thereof that they may embody the same by numerous modifications in structure and relation contemplated by this invention, a drawing depicting a certain form of the invention has been annexed as a part of this disclosure, and in such drawing, like characters of reference denote corresponding parts throughout all the views, of which:

Figs. 1 and 2 show three component parts of the assembly in connection with a cylindrical blade shank before and after completed assembly, respectively;

Figs. 3 and 4 show a similar assembly for a conical blade shank;

Fig. 5 is a sectional view of a modified part used in connection with this invention.

In these figures, numeral 1 indicates a wooden propeller blade, 2 its turned shank, 3 the socket and 4 the circular wedge, 3, 4 being the coupling means for said shank 2.

In the embodiment illustrated in Figs. 1 and 2, the shank 2 is turned cylindrically so it may freely enter the socket or sleeve 3 having a conical bore, and the circular wedge 4 is suitably shaped or turned to the required dimensions, so that it may not only fill in the space left between shank 2 and socket 3, but also create a suitable compression or wedging effect exerting itself from shank 2 towards socket 3 as the wedge 4 is fully driven into place, as shown in Fig. 2. The wedge 4 may be previously coated with glue or any other suitable binder (not shown) which, preferably, should be sufficiently unctuous so as not to interfere with the driving in of the wedge, and which, after having become dry shall intimately adhere to the shank 2.

All of the foregoing descriptive matter equally applies to the embodiment illustrated in Figs. 3 and 4. The wedge 4 of this assembly being circular in section has its inner face shaped to form a cone. Thus it will be necessary, in order to permit its being inserted between socket 3 and shank 2, to divide said wedge into several segments. Or slots (not shown) may be provided in the segments near their edges at the narrowest circumference of the wedge 4 so that it may be forced sufficiently to pass over the widest portion of said shank 2.

In all cases it may furthermore be advantageous to provide upon the inner face of the socket 3 longitudinally extending projections, or grooves, 5 (in the direction of the generation of the cone) which will penetrate into, or be penetrated by, the material of which the wedge is made without creating any appreciable resistance, while the latter is being inserted and which thus will insure a more intimate adherence between the metal of the socket 3 and the material proper of the wedge 4.

It may be readily seen that the assembly according to the invention provides for increased security: Thus if, due to insufficient initial compression, or of contraction, the wood of the shank and the substance of the wedge should develop a tendency of moving or floating within the socket 3, it will be obvious that the centrifugal force obtaining due to the weight proper of the blade 1 will act immediately to rewedge the whole within the conical lodging of the socket 3.

It is well understood that the several embodiments hereabove described and illustrated in the accompanying drawing are given by way of example only and that they may be varied within wide limits without departing from the scope of this invention.

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PUBLISHED

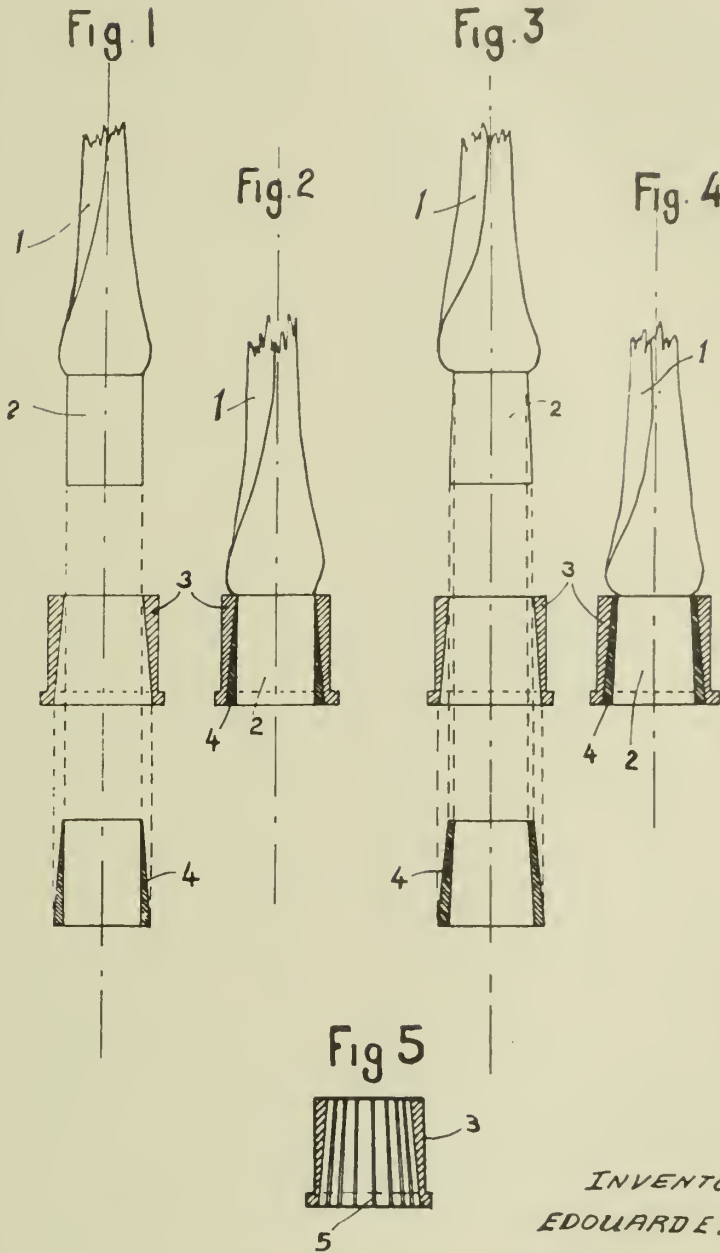
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DEVICE FOR FASTENING THE SHANK OF  
A PROPELLER BLADE  
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337,743



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# ALIEN PROPERTY CUSTODIAN

## SOLVENT TREATMENT OF NAPHTHAS AND THE LIKE

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No Drawing. Application filed May 31, 1940

This invention relates to improvements in the Edcleanu process for producing motor fuels, especially gasolines, of a high anti-knock value, described in United States Patents No. 1,585,473, dated May 18, 1926, and No. 1,661,566, dated March 6, 1928, and also to the production of improved lacquer solvents.

The patents describe processes of refining gasolines and kerosenes by splitting the crude distillate into a lower boiling and a higher boiling fraction, treating the latter with liquid sulphur dioxide and reblending the extract obtained by such treatment with the non-treated lighter fraction. This extract has a considerably higher content of aromatic and unsaturated hydrocarbons than the original stock and, since the presence of these constituents in the motor fuel is chiefly responsible for its anti-knock quality, it is apparent that by adding the extract obtained from the higher boiling fraction to the lower boiling one the anti-knock value of the latter is increased.

The anti-knock quality of a motor fuel is expressed by its "octane number", the anti-knock value being higher the higher the octane number. By employing the processes described in the above cited patents it has been possible to produce gasolines having octane numbers of 70 to 75. Sulphur dioxide treatment of the higher boiling fraction of a gasoline, as described in said patents, has been customarily done at temperatures between +14° F. and +20° F., the extract obtained in this manner having an average concentration of aromatic and unsaturated constituents of 35 to 40 percent.

New developments in the design of internal combustion engines, especially for aeroplanes, make it desirable to refine the gasoline to such an extent that the octane number is raised above the limit of 75 mentioned above.

We have found that such first grade gasolines may be produced by refining the higher boiling cut of the gasoline crude to such a degree that the extracts from this refining step have a very high content of aromatic and unsaturated hydrocarbons and are largely free of saturated hydrocarbons. By blending such extracts with the untreated gasoline fraction of lower boiling range, a gasoline is obtained, the octane number of which may be as high as 85 and above. With the methods employed for refining motor fuel so far, it has not been possible to commercially produce such a gasoline.

For producing extracts of the specification given above it is necessary to employ a solvent of excellent selectivity. Unfortunately any solvent is only slightly selective on low boiling petroleum fractions such as gasoline. However, we have found that liquid sulphur dioxide exerts a very high selective solvent action at temperatures substantially below zero degrees Fahrenheit, and that, if the extraction temperature is chosen suf-

ficiently low, the liquid sulphur dioxide splits the gasoline fraction into a raffinate being practically free of unsaturated hydrocarbons and an extract containing practically only unsaturated and aromatic hydrocarbons. This split will be sharper and the more complete the lower the temperature of extraction, and there is no technical but only an economical limit to reducing the extraction temperature.

Two factors are of chief importance for fixing the temperature of treatment with liquid sulphur dioxide, the one being the boiling range of the gasoline cut to be refined and the other its original content of aromatic and unsaturated hydrocarbons. The lower the boiling range of the gasoline fraction is and the higher its content of aromatic and unsaturated components the more advisable will it be to employ a very low temperature in extracting. Temperatures as low as -60 to -70° F. are still allowable for technical reasons as well as from an economical viewpoint.

According to our invention the following different steps may be employed for producing an extract of the specification given above:

(a) The naphtha fraction is treated with liquid sulphur dioxide at the conventional temperature of +14 to +20° F. in an extraction tower of conventional type. The extract layer obtained thereby by settling is further cooled down to about -60° to -70° F., whereby this extract layer is again split in two phases, an upper raffinate layer that has practically the same characteristics as the raffinate obtained in the first extraction step, and a new extract layer, which we may call second extract and which contains in some instances more than twice as much aromatic and unsaturated components as the extract obtained in the first step of extraction.

(b) Refining of the naphtha fraction is done in one single step, whereby the naphtha is cooled down to -60 to -70° F. and continuously introduced into the base of a conventional extraction tower which liquid sulphur dioxide of substantially higher temperature, for instance 14 to 20° F., is charged to the upper part of the tower. In continuous operation a temperature gradient will result from this method, the temperature of the liquid gradually decreasing from the top to the base of the extraction tower. The extract withdrawn from the base of the tower will be superior to that obtained in the first step of the method described under (a).

(c) Refining of the naphtha fraction is done in a single step as described under (b), but both stock and liquid sulphur dioxide are charged to the extraction tower with a temperature of -60 to -70° F. The extract obtained in this way will have a concentration of unsaturated and aromatic hydrocarbons equal to or even surpassing that of the extract produced by method (a), but requires somewhat more refrigeration.

In each of the three methods described above a series of mixers and settlers combined to make a unit that is conventionally called multi-stage mixing-settling equipment may be used in lieu of the vertical single extraction tower. It is further understood that the process described herein is not restricted to operation upon gasoline fuel nor to the temperature specified above.

As illustrations of the improvement, which may be obtained in treating light oils at temperatures substantially below zero degrees Fahrenheit, we mention the following examples:

#### Example 1

A naphtha cut with 57.9° A. P. I. gravity and a boiling range from 152 to 252° F. was treated in the countercurrent manner with 65% liquid SO<sub>2</sub> at +14° F. in one case and with 60% liquid SO<sub>2</sub> at -22° F. in another case. The yields of raffinate and extracts and their specifications are shown in comparison with the original naphtha in the following table:

	Original naphtha	Raffinate at +14° F.	Extract at +14° F.	Raffinate at -22° F.	Extract at -22° F.
Yield per cent by vol.-----	100	62	38	80	20
° A. P. I.-----	57.9	63.0	49.4	63.0	40.1
Per cent aromatic and unsaturated hydrocarbons-----	16	2.1	38.4	2.0	65.0
Saybolt color-----	+17	+23	+10	+23	+4

The content of aromatic and unsaturated hydrocarbons was determined by means of sulphuric acid of 100% strength.

A comparison of the figures shows that the raffinate yield is increased from 62% to 80% by carrying out the extraction at -22° F. instead of at +14° F., and that the concentration of the aromatic and unsaturated components in the extract was raised from 38.4% to 65%.

#### Example 2

A cracked naphtha with a 46.4° A. P. I., boiling range from 195 to 286° F. and containing as much as 50% aromatic and unsaturated hydrocarbons could not be extracted at all with liquid SO<sub>2</sub> at +14° F. because of entire miscibility at this temperature. However, by reducing the temperature to -22° F. a separation into raffinate and extract phase took place and the treatment could be carried out in the normal way. For comparison the cracked naphtha was treated with 100% SO<sub>2</sub> followed by two treatments with 50% SO<sub>2</sub> at -22° F. and in another case the same stock was similarly treated at -60° F. The latter treatment resulted in a greatly improved raffinate yield and in a higher concentration of aromatic and unsaturated components in the extract, indicating the advantage of extremely low treating temperatures in some instances. The results may be seen in detail from the following table:

	Original cracked naphtha	Raffi- nate at -22° F.	Extract at -22° F.	Raffi- nate at -60° F.	Extract at -60° F.
Yield percent by vol.-----	100	19	81	40	60
° A. P. I.-----	46.4	59.0	13.1	58.3	37.8
Percent aromatic and unsaturated hydrocarbons-----	50	6	61	6	80
Saybolt color-----	+23	+25	Dark	+25	Dark

The two fractions of the original naphtha from which the higher boiling one had been extracted with the result mentioned above had the following specifications:

#### Lower boiling fraction

Boiling range ----- 100-180° F.  
Amount----- 93 vol. % of original stock

#### Higher boiling fraction

Boiling range ----- 170-250° F.  
Amount----- 7 vol. % of original stock

The octane number of the untreated lower boiling fraction was 78.

The yield of extract from the higher boiling fraction was 60%, and this extract contained 80% aromatic and unsaturated compounds. The extract was rebled with the whole untreated lower boiling fraction with the result that the octane number was raised to 84.

The extraction of naphtha fractions at such low temperatures as mentioned above can be avoided when using an auxiliary solvent, which increases the selectivity of liquid sulphur dioxide. In this case extraction temperatures as low as 14° F. are sufficient to obtain extracts with higher contents of aromatic and unsaturated compounds.

#### Example 3

The naphtha fraction used in this example had the following boiling range:

I. B. P.-----	220
10-----	229
20-----	232
30-----	236
40-----	240
50-----	244
60-----	249
70-----	255
80-----	263
90-----	276
End pt.-----	304

The A. P. I. gravity of this untreated fraction was 49.0.

This naphtha fraction was extracted with sulphur dioxide and several mixtures of the latter with an auxiliary solvent, such as ethylene glycol, diethylene glycol and trimethylene glycol. All extractions were carried out at 14° F. and the extracts showed the following specifications:

	Extraction with sulphur dioxide	Extraction with sul- phur diox- ide plus ethylene glycol 20:80	Extraction with sul- phur diox- ide plus diethylene glycol 20:80	Extraction with sul- phur diox- ide plus trimethyl- ene glycol 20:30
° A. P. I.-----	44.5	39.1	38.4	38.7
Per cent aromatic unsaturated hy- drocarbons-----	48	68.7	70.7	69.3
Saybolt color-----	+9	0	10	Dark

Other extractions were carried out with a similar favorable effect with mixtures of sulphur dioxide and the following auxiliary solvents: benzylalcohol and diacetone alcohol. The separation of these auxiliary solvents from the raffinates and extracts was effected with the first one by means of distillation and with the second one by means of washing out the solvent with water.

As auxiliary solvents suitable for use in accordance with this invention, there can be used any solvent miscible with liquid sulphur dioxide and selective against saturated low boiling hydrocar-

bons, which has a suitable boiling point in comparison with the naphtha fraction or which can be washed out of the raffinates and the extracts by means of other solvents easy to separate from the naphtha hydrocarbons.

Naphtha extracts produced by means of liquid sulphur dioxide at the normally employed extraction temperatures of +14 and +20 degrees Fahrenheit have also been used as lacquer solvents. The kauri gum number is an indication of the amount of naphthenic constituents present in a lacquer solvent, and a good solvent should have a kauri gum number of not less than 70.

#### Example 4

A naphtha from Gulf Coast crude was treated with sulphur dioxide at temperatures between -40°F. and +14°F. Four treatments with 37.5% of SO<sub>2</sub> by volume were given at each temperature, and the kauri gum number of the extract determined.

Treatment with SO <sub>2</sub> in batch volume, percent	Original (untreated)	1	2	3	4
		1×37.5	1×37.5	4×37.5	4×37.5
Temperature, °F		+14	0	-14	-40
Extract yield, volume percent		47	45	39	32
Kauri gum No	46.5	61	65	71	77

It can be seen from the table that a satisfactory lacquer solvent cannot be obtained from a naphtha distillate with a naphthenic base by treat-

Methods (a) and (b), above described, as compared with treating the entire volume of naphtha at low temperatures. The following examples are illustrative.

#### Example 5

(a) A naphtha sample was treated at 0°F. with 70% by volume SO<sub>2</sub>. The extract solution, instead of charging it directly to the solvent recovery still, was first cooled to -60°F. which resulted in the separation of an intermediate oil. The three products, raffinate, intermediate oil and extract, were freed from SO<sub>2</sub> and analyzed, the results being as shown in the table below.

(b) The same naphtha was extracted counter-currently at a temperature decreasing from 0°F. to -60°F. with 70% by volume SO<sub>2</sub>, the conditions being such that the SO<sub>2</sub> was admitted at the top of the extraction tower at a temperature of 0°F. and the naphtha stock at the bottom at a temperature of -60°F. By suitable cooling arrangements the temperature at the top of the extraction tower was held at 0°F., in the middle of the tower at -30°F. and at the bottom at -60°F. The results are shown in the table below.

(c) For purposes of comparison, the same stock was treated under the same conditions as in (b) excepting that a temperature of -60°F. was maintained in the whole tower. The results of these treatments are shown in the following table:

	Original oil	Treatment							
		(a)			(b)		(c)		
		70 vol. percent SO <sub>2</sub> , at 0° F., extract cooled to -60° F. to reject intermediate oil			70 vol. percent SO <sub>2</sub> gradient 0° F. to -60° F.		70 vol. percent SO <sub>2</sub> -60° F.		
		Raf.	Int. oil	Extr.	Raf.	Extr.	Raf.	Extr.	
Yield	100	53.5	13.6	32.9	66.0	34.0	66.0	34.0	
° A. P. I.	46.8	53.7	50.8	34.0	51.0	33.6	53.9	33.7	
Vol. percent aromatics + olefines	29.8	2.0	9.5	82.0	0.8	84.0	0.8	83.3	
Kauri gum No.	46.1	32.7	38.3	81.9	32.4	82.4	32.5	82.4	
Octane No. C. F. R.	57.9	Below 41	46.2	91.1	Below 41	90.8	Below 41	91.1	

ment at 14°F (the usual treating temperature of solvent refining by the Edeleanu method) nor even at 0°F., but that it is possible to produce superior lacquer solvents by treating at -14°F. and lower temperatures.

Naphtha extracts which are manufactured in accordance with this invention by treating the stocks with sulphur dioxide at substantially below +14° Fahrenheit, that is down to -70° Fahrenheit, are superior to the normal extractions inasmuch as they have a higher solubility for lacquer because of the higher percentage of aromatic and unsaturated components present. One of the great advantages of naphtha extracts over other lacquer solvents consists in that their boiling range increases gradually and evenly without showing breaks in the distillation curve. Consequently the formation of streaks, after applying the lacquer solution, is eliminated. The extraction may be carried out in the same manners as specified above in reference to motor fuels under (a), (b) and (c).

A substantial improvement in results and saving may be obtained by following the steps of

It is evident from these data that the temperature gradient extraction, Example 5(b) gives the same yields and qualities of raffinates and extracts as the normal treatment (Example 5(c)). The extract obtained by rejection of the intermediate extract in Example 5 (a) has almost the same quality as the extracts obtained in Examples 5 (b) and 5 (c), but the yield is somewhat lower, the reason for this lower yield being that the intermediate oil which was obtained by cooling the original extract solution from zero to -60° F. still contains substantial amounts of aromatics and olefines. The intermediate oil may, of course, be recycled into the extraction tower, thereby raising the extract yield.

The invention is not restricted to motor fuels and lacquer solvents, but relates to the process of producing improved extracts and blends thereof suitable for these and other purposes; and where motor fuels and lacquer solvents are referred to in the claims, it is to be understood that we intend thereby to include any use to which the product is adapted.

ERNST TERRES.



# ALIEN PROPERTY CUSTODIAN

## AIRCRAFT ENGINE CONTROLS

Fritz Gossiau, Berlin-Charlottenburg, and Johannes Schmidt, Berlin-Eichkamp, Germany; vested in the Alien Property Custodian

Application filed June 5, 1940

Our invention relates to an arrangement and means for controlling the operation of an aircraft engine.

In aircraft engines, the two factors, speed and torque, upon which the developed engine power depends, change with varying operating conditions. To what extent these two factors contribute at any instant to develop the required power depends chiefly upon the engine and the propeller characteristics. If the engine characteristic and that of the propeller are not brought into a proper relationship with each other, it may happen that the engine is exposed to danger resulting, e. g., from overload, or that it operates uneconomically. In the case of an increase in speed (R. P. M.) a mechanical overload may occur, while overheating may result from an undue increase in torque. The danger of an overload as the result of undue increase in speed occurs, for instance, in the case of an engine driving a propeller particularly adapted for the take-off, i. e., a propeller having a relatively small pitch, if the engine is required to develop the maximum power when flying at high altitudes. Overheating may be caused during the take-off if the engine is equipped with and drives a propeller particularly designed for altitude flight, i. e., a propeller having a relatively large pitch. In the first case, the engine will race due to decreased torque at high altitudes, and in the second case, it will be overloaded during take-off due to the great torque resulting from the pitch of the propeller blades.

The object of our invention is to provide an arrangement for controlling the operation and the power of an aircraft engine whereby it is possible to prevent, under all operating conditions, overstraining or overheating of the engine. This object is accomplished by employing an adjustable pitch propeller and correlating at all times the speed of the engine or the pitch of the propeller with the torque or the motive power of the engine, for example, the fuel supply, in such a manner that the torque resulting from the pitch of the propeller is always in proper relation to the speed developed by said engine and required under all flying conditions.

Practically, this control is in the simplest case accomplished by the use of a common adjusting device whereby the pitch of the propeller and the position of the throttle valve in the fuel supply of the engine are rendered variable. The operator may thus at all times adjust the required engine power and operating conditions by means of a single handle, without paying atten-

tion to speed and torque factors that must be correlated to avoid overstraining or overheating.

The power of aircraft engines is also affected by external conditions which vary in accordance with the altitude of flight. The novel control may readily be adapted to take also these conditions into account by the use of automatically operating governors, i. e., governors which automatically compensate for external influences and maintain at all times the desired operating values. Common adjusting means may be provided with these governors so as to enable the operator to adjust the power of the engine to the desired value, without paying special attention to overstraining or overheating.

The novel control may be carried out by providing a common adjusting device, e. g., a cam or the like, cooperating with sleeves of two suitable sleeve valves of hydraulic devices, one of which controls the setting of the propeller pitch and the other of which controls the fuel supply through the medium of a suitable throttle valve or the like.

The known manner of regulating the operating conditions in accordance with fuel charge pressures or density of the fuel charge is insufficient when it is desired that the control of the proper speed and torque values or motive power is maintained at all altitudes of flight. The effect of the varying altitudes on the engine operation, i. e., the varying air pressures encountered, must be taken into account, because they affect the residual gas proportion and the temperature of the fuel charges. According to the invention, this influence is compensated for by the provision of an auxiliary governor which corrects the supply of the operating fuel in accordance with the outer air pressure. This auxiliary governor is preferably made so that it may be selectively disconnected in order that the motor may be operated to develop, whenever required, the greatest possible power in accordance with the greatest permissible supercharger pressure. This may be accomplished, according to the invention, by providing mechanism for putting the auxiliary governor out of operation upon adjustment of the manual controls to certain desired maximum values. Thus, if the operator actuates the corresponding control lever provided for the power control of his engine to the end position corresponding to the maximum output, the auxiliary governor will be automatically disconnected, and the motor can then be adjusted to that value of the desired power which can be temporarily maintained at

all altitudes in order to meet emergency conditions.

The control impulses for regulating the supply of the operating fuel in accordance with torque or motive power control independent of the altitude of flight are preferably derived from the fuel charge pressure or from the density of the fuel charge. However, this procedure need not be employed, since there are other ways of reaching the object of the invention, particularly if the drive of the propeller is effected by the engine through a transmission gear. According to the invention, it is proposed to employ for this purpose the supporting gear wheel, which in such a transmission does not revolve, by resiliently supporting it against a stationary part of the transmission casing or the like. The torque balance which is thus obtained is used for controlling the supply of the operating fuel to the engine.

The objects explained above and other objects and features not specifically noted are described more in detail in the following explanations rendered with reference to the accompanying drawings. In these drawings:

Fig. 1 shows a diagrammatic representation of one embodiment of the new control system; and

Fig. 2 illustrates a modification with certain parts in section.

Referring now to Fig. 1, the engine speed is controlled by a speed governor 1 of generally known structure, which controls the adjustment of the two blades extending from the shafts 2 and 3 of an adjustable pitch propeller shown in part diagrammatically at the left-hand side of the drawings. The latter control is effected by transmitting the motion of the governor sleeve 4 to an auxiliary control piston 5 which slides in a movable sleeve 6 within a cylinder 7. These parts form an auxiliary control by means of which the supply to and discharge of oil under pressure from the hydraulic motor 8, similar in design to a rotary valve, is governed by way of the lines or conduits 9 and 10. An adjusting movement of the motor 8, effective to the propeller blades, is transmitted from the gear 11 through the gear 12 and the worm 13 to the propeller blade extending from the shaft 2 and through the gear 14 and worm 15 to the other propeller blade extending from the shaft 3, respectively. The actuation of the gear 11 of the hydraulic motor 8 is thus responsive to varying pressures transmitted over the pressure supply lines 9 and 10 from a suitable supply by way of the control comprising the cylinder 7 which contains the sleeve 6 and the piston 5; this control being interposed in the pressure supply lines, as shown in the drawings. These pressure supply lines enter into the cylinder 7, and the sleeve 6 is provided with suitable ports. Its position with respect to the pressure lines therefore controls the flow of operating fluid in the direction of the arrows, and consequently the supply and flow of such fluid from and to the hydraulic motor 8. The position of the sleeve 6 is determined by a common control cam 28 which will be discussed presently more in detail. It will be seen, however, that the piston 5 constitutes an additional control of the flow of liquid. This piston, which, as shown, may comprise two spaced portions, is movable within the sleeve 6 and is suitably linked to the sleeve 4 of the governor 1. Any motion of this piston in response to speed variations of the engine exercises a control over the ports in the cylinder 6. Specifically, with the engine at low speed, the piston will be in its

lowermost position substantially as shown in the drawings. The ports in the sleeve 6 shown adjacent the places where the supply lines 9 and 10 terminate in the cylinder are blocked. With the engine at high speed, piston 5 will be raised more or less toward its other terminal position, depending on the engine speed at any moment, and the ports in the sleeve 6 will be correspondingly opened, either partially or wholly. However, the extent to which liquid can be transmitted over the feed lines 9 and 10 obviously depends on the position of the sleeve 6 within the cylinder 7, and this position is adjustable by means of the control comprising the member 28 which may be a cam or the like secured to a suitable shaft 29 and operable from a handle or hand wheel, such as 30. The sleeve 6 thus constitutes a device for setting or adjusting the propeller pitch to a desired mean value, which is subject to modification by the governor 1 in accordance with the engine speed. It may be noted that two feed lines 9 and 10 are shown on one side of the cylinder 7, while three pressure lines are indicated on the other side. The reason is that reverse operation of the motor 8 must be provided for.

The throttle valve 16 arranged in the intake pipe 17 leading to the fuel supply of the engine is actuated by a similar hydraulic control device 37 under the control of a suitable barometric device 18, the operation of which depends on the pressure or volume of the gas enclosed therein.

The device 18 is located in a chamber 19 which may be connected to the fuel supply conduit 17. If the pressure in the conduit 17 increases or decreases, the barometric member 18 contracts or expands correspondingly, and therefore displaces the cam 20 which in turn causes displacement of the auxiliary control piston 21 movably mounted within the slide valve sleeve 22 disposed within the casing 23. The sleeve 22 constitutes a device for manually adjusting the throttle valve 16 and is controlled through the medium of cam 29 in a manner which is clearly apparent from the drawings. The motor for operating the throttle 16 is thus controlled not only by the auxiliary control piston 21 but also by the sleeve 22 and consists, in the embodiment illustrated, of a generally known structure comprising a piston 25 movably arranged in a cylinder 24. The auxiliary control 37 and the control motor 25 for the throttle valve 16 are connected with each other by means of the conduits 26 and 27. The operation is effected by any desired control medium, such as, for instance, oil under pressure from a suitable supply connected to the cylinder or housing 23 by means of the three pipes shown at the left of cylinder 23. The three feed pipes or lines at one side of the cylinder 23 are required in this instance for the same reason as discussed in connection with the control unit 7, namely, to provide for movement of the piston 25 in both directions.

The two control devices for adjusting the desired operating values comprising the slide valve sleeves 6 and 22 for the governors 1 and 18, as above described, are under the control of a cam 28, as previously mentioned. This cam is mounted on a shaft 29 carrying a hand wheel 30 at one end thereof which may be actuated by the operator. The hand wheel 30 may, if desired, be provided with a pointer 31 so as to furnish at all times an indication on a scale 32 of at least approximately the adjusted engine power.

It will be seen from the explanations so far rendered in the foregoing, that the invention contemplates control means for variably adjusting the pitch of the propeller blades, control means for variably adjusting the throttle or fuel inlet for the engine, a common device for selectively pre-setting or adjusting said control means to selected desired values, together with means for additionally adjusting said first control means in accordance with the speed of the engine, and means for additionally or independently adjusting said second control means in accordance with pressure conditions in the fuel supply of the engine.

The influence of the varying engine power due to the fluctuations of the exhaust back pressure of the engine in response to atmospheric pressures encountered at varying altitudes of flight, is compensated for by an auxiliary governor comprising, in the embodiment shown in Fig. 1, a barometric measuring device 33, a hydraulic auxiliary control 34, and a hydraulic control motor 35 which corrects the position of the throttle valve 16 with the aid of a cam 36 which is adapted to exercise control over the pressure device 18, and thus an additional corrective control over the device 37 and the motor 24 including the piston 25.

The operation of this last noted control provision responsive to atmospheric pressures appears to be clear from the drawings without the aid of elaborate explanations. It falls broadly along the line of operating principles which also govern the previously described control devices 7 and 37. As the pressure decreases in high altitudes, the member 33 expands and moves the piston 41 within the sleeve 40. The flow of operating liquid under pressure is thus controlled for causing a corrective motion of the piston 39 and corresponding motion of the cam 36. This cam in turn effects the motion of cam 20 through the medium of the enclosed barometric device 18. Accordingly, piston 21 of the control device 37 is moved, with the result that the flow of operating fluid under pressure is correspondingly effected over the pipes 26, 27 to move the piston 25 of the throttle motor. The valve or motor 16 is thus automatically actuated to compensate for the atmospheric pressures encountered.

The auxiliary motor or governor 35 is equipped with return or resetting means comprising the lever 38 which upon movement of the piston 39 brings the sleeve 40 of the control device 34 again into the position of alignment with respect to the control piston 41. A return provision is not necessary for the governor 1 and the regulator 18 since their return is brought about by their operation as such. In the case of the

device 1, it is changed speed which brings about the alignment position between the control piston 5 and the sleeve 6; and in the case of the device 37 (18), it is changed pressure in the conduit 17 which causes the proper re-alignment between the control piston 21 and the sleeve valve 22.

The previously mentioned mechanism, by means of which the auxiliary governor comprising the devices 33, 34, and 35 may be put out of operation when it is desired to adjust the engine to the maximum output, includes the cam denoted by numeral 42. This cam is mounted together with the cam 28 on the shaft 29. If the operator desires to obtain maximum power regardless of atmospheric conditions, he operates the hand wheel 30 until the cam 42 presses the control piston 41 into its lowest position, thus causing a further opening of the throttle valve 16 as a consequence of operating steps previously discussed and apparent from the drawings.

In the arrangement shown in Fig. 2, the speed is controlled in the same manner as in the arrangement according to Fig. 1, as may be seen from the placement of identical parts shown in the upper portion of the drawings. However, the control of the throttle valve 16 is in this case not effected in accordance with the air pressure, but as a function of the torque imparted to the propeller by the engine. The propeller is driven by the shaft 43 carrying the bevel gear 44 firmly mounted thereon and which rolls upon the gear 48 through the medium of bevel gears 45 and 46 carried on the shaft 47. The gear 48 is elastically or resiliently supported against the casing 49, as indicated at 54, so that the deflections of the gear 48 in one or the other direction are a measure of the torque imparted to the propeller by the engine. In other words, the gear wheel 48 operates in the manner of a torque balance. The deflections of the torque balance thus formed by the gear 48 are transmitted to the shaft 52 through the medium of the toothed connection comprising the gear 51 engaged by the teeth 50 of gear 48. The shaft 52 is thus rotated in one or the other direction according to the angular deflection of gear 48, and operates a suitable rack or the like which is connected, as shown, at one side to the piston of the control device 37 and at the other side to the plunger of a dash pot or oil brake 53. This latter prevents a hunting of the control 37 and steadies its operation. The operation of the throttle 16 is controlled, as previously discussed, by a motor governed in its action by the control device 37.

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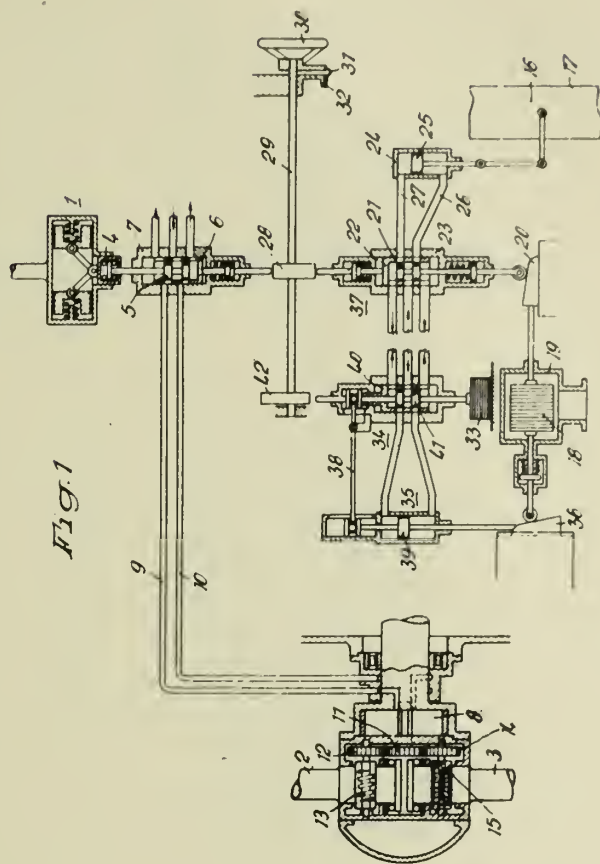
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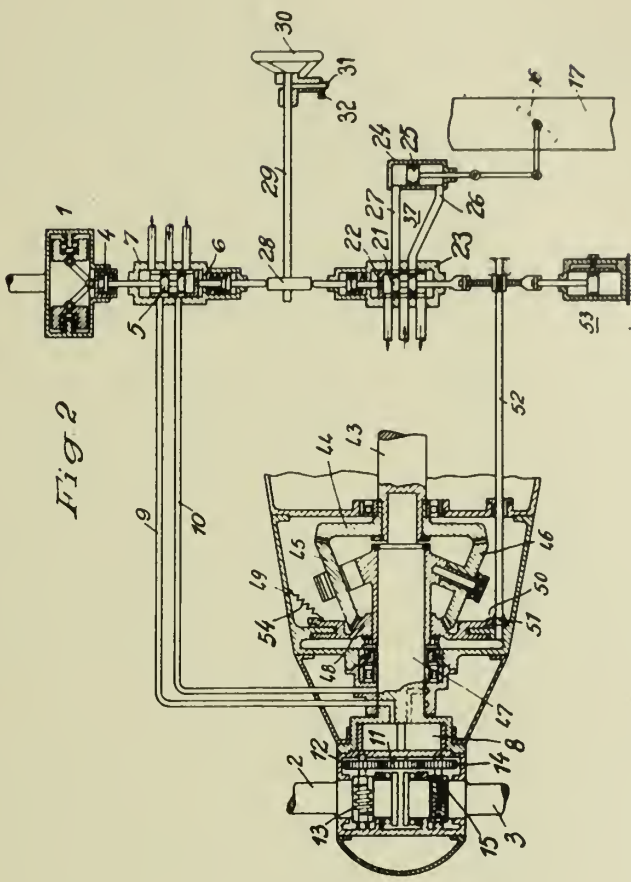
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# ALIEN PROPERTY CUSTODIAN

## VARIABLE RESISTORS

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Application filed June 10, 1940

The invention relates to variable resistors having a contact cooperating with the resistor and which instead of the switch devices hitherto known are to be employed alone or in connection with residual current circuit breakers to interrupt power circuits. Such resistors carry a very high load and must be varied very rapidly, so that disturbing influences occur at the contact surface which may so unduly stress the resistor and contact as to damage them within a short time. These influences are on the one hand the cause of unduly high current densities with subsequent excessive heating and wear and tear, particularly at one edge of the contact, and on the other hand of a sparking at this edge with similar consequences. According to the invention such influences are avoided by suitable means.

The current is caused according to the invention to flow along such paths in the resistor, contact or in both parts as to prevent an undue crowding of the current paths at one edge of the corresponding contact surface. Fig. 1 of the drawings illustrates the undesired crowding of the current paths if the contact *s* consists as is usual entirely of metal. If the conductivity of the contact is indefinitely great as compared to the resistor *w*, the current paths are crowded at the edge *k* of the contact *s* spaced from the current junction *a* even if they enter the resistor at the current junction *a* uniformly distributed. The current density is also indefinitely great at the current junction. This is due to the unequal length of the current paths along the upper and lower side of the resistor. The detrimental effects mentioned above are already brought about upon merely approaching the theoretical limit illustrated in the drawing, that is to say, in the case of the definite conductivity of the usual metal contacts.

According to the invention the crowding of the current paths is prevented either by suitably selecting or distributing the specific resistance of the resistor, contact or of both parts, also by giving the one or the other part a suitable shape, further by suitably distributing the contact resistance over the corresponding contact surface as well as by suitably distributing the contact pressure over this surface or by selecting and distributing the conductive resistance. The means, whereby this may be accomplished, may also be combined in various ways.

The resistance in the different current paths may be made equal to a certain extent, if the contact and resistor are made of the same ma-

terial. The distribution of the current paths thereby obtained is roughly illustrated in Fig. 2. In this case the contact edge *k* carries a considerably smaller load than according to Fig. 1, this, however, being disadvantageous for certain instances. The resistance in the current path *c* extending along the upper surface of the resistor *w* and the left-hand surface of the contact *s* is smaller than that in the current path *d* extending near the lower surface of the resistor *w* and near the right-hand surface of the contact *s*. A greater current density will therefore be brought about in the neighborhood of the left-hand contact edge *k* than in the neighborhood of the edge *l*. Consequently, the resistance in the different current paths between the two current junctions or terminals *a* and *b* of the resistor *w* and contact *s* respectively is rendered according to the invention as uniform as possible.

An effective improvement is obtained if the specific resistance of the contact varies along the surface in engagement with the resistor. Also a variation of the specific resistance of the resistor contributes in bringing about the same resistance in the different current paths. The stippled surface illustrated in Fig. 3 indicates according to the invention the variations of the specific resistance of the resistor *w* and contact *s*, the points at which the dots are more crowded indicating a greater resistance. Along the contact surface the specific resistance of the resistor *w* is greatest. The current flowing from the current junction *a* tends therefore to follow paths towards the lower side of the resistor, i. e., away from the dangerous point *k*. By increasing the specific resistance of the contact *s* with respect to its edge *k* the current paths may also be shifted away from this edge so as to prevent an undue current density at this edge.

The specific resistance of the contact and that of the resistor may also vary according to the same law along the surface serving for the passage of the current, so that the drop of the specific resistance is approx. the same in both bodies.

Fig. 4 shows an embodiment of the invention which is somewhat less complicated than the non-homogeneous bodies *w* and *s* according to Fig. 3. These bodies consist as shown in Fig. 4 of individual layers 1 . . . 4 of different specific resistance, the different shadings indicating a distribution of the specific resistance and of the current path as illustrated in Fig. 3.

The change in resistance is also adapted to the manner in which the contact moves. If the con-

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tact slides on the resistor it may be preferable to uniformly vary in opposite directions the specific resistance of both parts along the surface serving for the passage of the current. Fig. 5 shows such an embodiment in which the contact is designed as is also the resistor in the form of a rod or plate. Both bodies consist of sections 1 . . . 5 of a different specific resistance, arranged in opposite sequence. As will be seen from the current paths shown in Fig. 5 the distribution of current at the contact surface is symmetrical with respect to the center of the latter. Consequently, an undue current density cannot occur at this edge. The main portion of the current passes between parts of the same specific resistance (here, for instance, between 2—2). It would even suffice when giving the resistor and contact the same shape to make both parts of approx. the same material having the same specific resistance, since also the symmetry of the distribution of current is then ensured. The form of the invention shown in Fig. 5 is, however, more advantageous, since the specific resistance at the outer edges of the two parts sliding on one another is greatest and an undesired increase in current density is avoided at these points. The two parts *w* and *s* may be moved in opposite directions in order to increase the control speed.

If the resistor and contact or one of these bodies is given a cylindrical shape, i. e., the one body rolls on the other, the specific resistance along the rolling surface serving for the passage of the current may vary preferably in the same direction along this surface. The rolling body consists, for instance, as shown in Fig. 6 of sectors 1 . . . 5 of different specific resistance. Both the resistor and the contact are preferably subdivided into sections of different resistances. In this case the arcs of the sectors of the rolling body should be equal to the lengths of the sections of the resistor, so that only parts of equal specific resistance come into contact. Consequently, the specific resistance in the contact increases in the same direction as that in the resistor.

Figs. 7 to 12 show further instances for preventing an undue crowding of the current paths or at least their causes by giving the bodies employed a suitable shape.

The shape may be given either by varying the cross-section or the longitudinal section of the resistors or contacts.

According to Fig. 7 the cross-section of the resistor and contact is enlarged at the outer side of the angle or arc formed by the current paths. The apex of said angle coincides with the edge of the contact. About this edge the current paths are bent in an angle- or arc-like manner as will be seen, for instance, from Figs. 2 to 4. Since the innermost current path with respect to the edge *k* is the shortest, the width of the resistor and contact is smallest at this point according to Fig. 7 and is enlarged towards the opposite cross-section edge *l*. The center of gravity of the current carrying cross-section is thereby shifted from the dangerous point and the heat produced is therefore more uniformly distributed. Furthermore, the point *k* of the greatest current density is best cooled.

In the following embodiments the resistors, contacts or both are given such a shape in the longitudinal section that the current paths have the same length. According to Fig. 8 the longitudinal section of the resistor *w* and according

to Fig. 9 of the contact *s* is so curved that the center of curvature is opposite to the current junction of the other part. In this manner the current path lying near the edge *k* is lengthened and a concentration of the current in this path is prevented. According to Fig. 10 the longitudinal section of the contact has a wedge-like shape, whereby the current path in said section extending near the edge *k* is longer than that extending near the edge *l*. Also this contributes to bring about a uniform distribution of current in the contact cross-section. A similar shape may also be given to the resistor *w*. In order to attain the same length of the current paths the surfaces *a* and *b* of the resistor *w* and contact *s* may be inclined with respect to the central current path in these bodies and, if desired, curved in a suitable manner, as will be seen from Fig. 11. A similar effect may be attained according to Fig. 12 by the fact that the current paths at the inner side of the angle or arc formed by the same are lengthened, for instance, by notches *e* provided in the contact *s*. All the embodiments described above may be combined in any suitable manner.

If the distribution of current in the contact surface is to be rendered uniform by the selection of the contact resistance, the contact resistance at the edge *k* of the contact near the current junction *a* of the resistor must be made greater than that at the opposite edge *l*. The contact resistance must decrease uniformly or gradually towards the edge *l* in order that the current paths be shifted away from the dangerous edge *k* of the contact. The contact resistance may be influenced by suitably machining the brush surface in contact with the resistor, by metal or insulating material coatings suitably distributed over this surface or in any other suitable manner.

The distribution of current over the contact surface may be further influenced by gradually increasing the contact pressure on this surface. The contact pressure is preferably smallest at the edge *k* of the contact *s* and increases towards the opposite edge *l*. This may be effected in a simple manner by an asymmetrical current load of the contact according to the invention. The contact depending upon the manner in which it is secured to its support may be subjected to a tilting moment which tends to tilt it about the edge *l*.

The current paths may be influenced by suitably selecting and distributing the inductive resistance as will be seen from Fig. 3 with the aid of magnetically conducting bodies *m* which surround at the inner side of the angle formed by the current paths a portion of the current-carrying cross-section of the resistor *w* or contact *s*. The current paths which traverse the inner space of the horse-shoe shaped body *m* having a greater inductive resistance, since the intensity of the field interlinked therewith is increased. Also in this arrangement the current paths are shifted into the cross-section portion having a smaller inductive resistance and are partly kept away from the dangerous edge *k*. A similar effect may also be obtained by adding magnetic material to the resistor or contact. The material must be distributed in a similar manner as the particles of higher specific resistance according to Fig. 3 or arranged in layers as shown in Fig. 4.

According to the invention also provisions must be made besides the means described above to

suppress a sparking of the contact. Since the undesired sparking contributes also to heat up particularly the edge  $k$  of the contact, a suppression of the sparking supports the action of the means so far described in such a manner that the reliability of operation of the regulating device is enhanced and the life of the parts subjected to wear is considerably lengthened.

Means for suppressing the sparking of the contacts are well known. However, such means are employed according to the invention on an entirely new principle, whereby the abovementioned advantage are obtained. It is, for instance, also well known to reduce the sparking at the contact points by grinding the contact surface of the bodies to such an extent that an interstice of the order of magnitude of 0.01 mm is left therebetween. The limit for the permissible width of this interstice amounts to about 0.02 mm at contact points exposed to the air. (Paschen ignition voltage curve). The grinding operation may be less accurately effected or the interstice may be wider if the sparking is suppressed by other measures, for instance, by embedding the contacts in a medium which suppresses the sparking.

By a rapid change of the resistance value and of the current flowing through the resistor additional voltages occur across the resistor which support flash-overs exteriorly of the contact points, thus deteriorating also the bodies employed. Furthermore, the dangerous edge  $k$  is indirectly heated. The liability of operation of the regulating device may be therefore also increased by covering the resistor, the contact or both in such a manner with insulating material that flash-overs are prevented at the outer side of these bodies. The covering with insulating material is preferably effected in the manner that the resistor and the contact are completely surrounded by insulating bodies. In Fig. 14  $w$  denotes the resistor,  $s$  the contact,  $i_1$  the insulating body surrounding the resistor  $w$  and  $i_2$  the insulating body surrounding the contact  $s$ . The two insulating bodies cover the surfaces for the passage of current, provided that these surfaces are not being employed for the passage of current.

The resistor  $w$  and contact  $s$  may also be so arranged without the outer covering of insulating material when employing insulating pieces  $i$  as shown in Fig. 15 that parts of the surface serving for the passage of the current are not uncovered in any position.

Also the resistor and contact may be so arranged that they completely cover in relation to one another the surfaces serving for the passage of current. As will be seen from Fig. 16 the said two bodies form hollow cylinders arranged the one within the other and which may consist as the resistor and contact shown in Fig. 5 or 6 of the individual sectors 1 . . . . 5 of different spe-

cific resistance. The points from which the current is taken are preferably arranged at the opposite ends of both hollow cylinders. According to Fig. 17 the resistor and the contact are formed of two discs which also consist of sectors 1 . . . . 5 of different specific resistance. For the control, the hollow cylinders according to Fig. 16 and the discs according to Fig. 17 are rotated with respect to one another. Since the surface for the passage of the current has no uncovered parts, also no appreciable sparking—particularly in the case of a smooth grinding—can occur at this surface. The outer surfaces of the hollow cylinders and discs may be covered with insulating material. The current junctions are to be arranged on the sectors of the smallest resistance denoted by the numeral 5.

As already mentioned the sparking may be further suppressed by embedding the variable resistors in a suitable medium. The resistor may be arranged in vacuum or in a medium of considerable disruptive strength (oil or the like) which suppresses the sparking.

To relieve the current junction to a further extent it is preferable to subdivide the junction into various parallel or series-connected junctions. Depending upon the voltage or current to be controlled the parallel or series connection is to be employed. It may be of advantage to combine the parallel connection and series connection of current junctions or regulating elements. An instance for a particular type of parallel connection of current junctions is shown in Fig. 18. The resistor  $w$  and contact  $s$  engage one another in a comb-like manner, whereby the contact surface is considerably increased. The contact as well as the resistor consist of various parallel-arranged rods or plates which are slidably arranged between the parts of the resistor. In this case also the resistor and contact may be designed in the same manner so that two resistors consisting of parallel plates or rods may come into engagement with one another in a comb-like manner by shifting the one with respect to the other. Various contacts  $s_1, s_2$  which move in opposite directions may also be arranged on resistance plates  $w$  as shown in Fig. 18. The plates of the resistors  $w$  are loosely arranged one upon the other and are pressed together and against the support  $u$  by means of springs  $f$ . In order that the projections of the contacts  $s_1$  or  $s_2$  may follow the pressing of the resistance plates they are separated from one another except for a web carrying the current junction  $b_1$  or  $b_2$ . The parts of the embodiment shown in Fig. 18 may be designed in a manner similar to that shown in Figs. 3, 4 or 5, i. e., the specific resistance of the contact and resistor may also vary along the surface serving for the passage of the current.

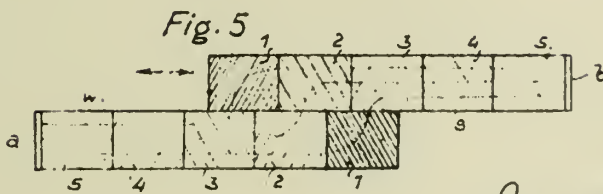
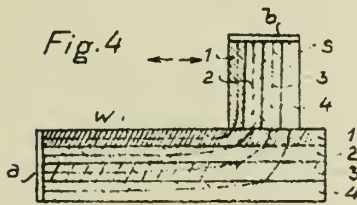
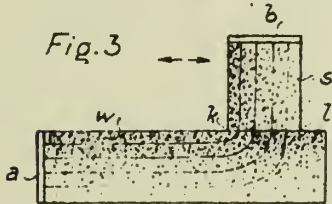
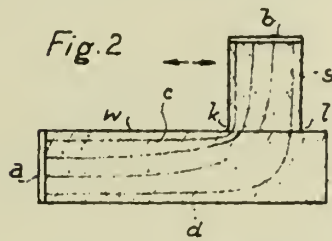
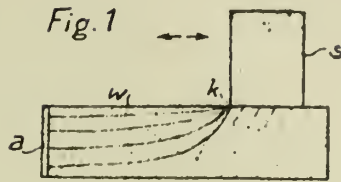
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MAY 18, 1943.  
BY A. P. C.

R. SCHADE  
VARIABLE RESISTORS  
Filed June 10, 1940

Serial No.  
339,725  
3 Sheets-Sheet 1



Inventor:  
Rudolf Schade  
By Richardson & Amer  
Attys: 419



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R. SCHADE

VARIABLE RESISTORS

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Serial No.

339,725

3 Sheets-Sheet 2

Fig. 6

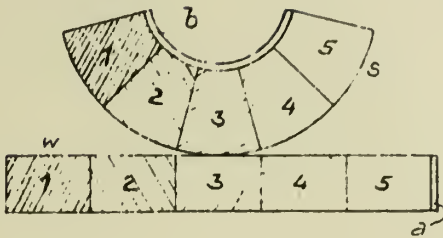


Fig. 10

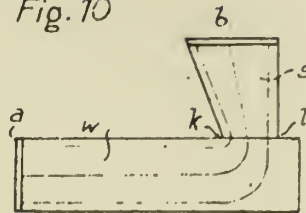


Fig. 7

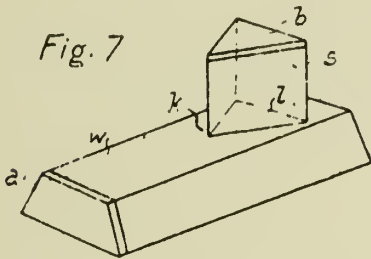


Fig. 11

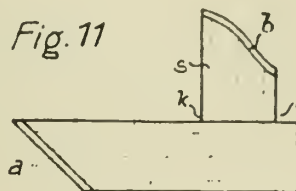


Fig. 8

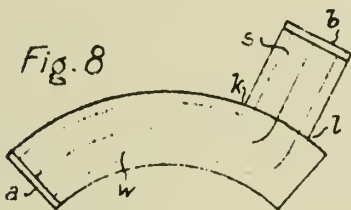


Fig. 12

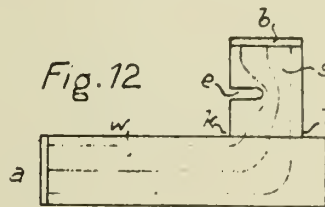


Fig. 9

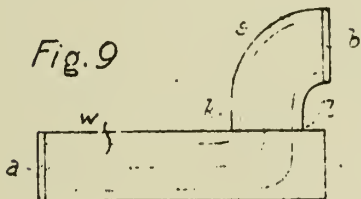
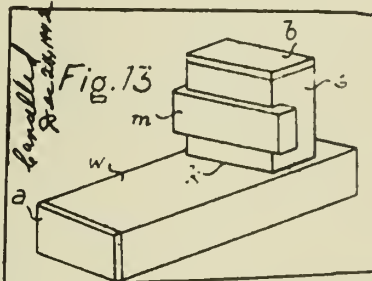


Fig. 13



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Serial No.  
339,725  
3 Sheets-Sheet 3

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*Dec. 24, 1942*

Fig. 14

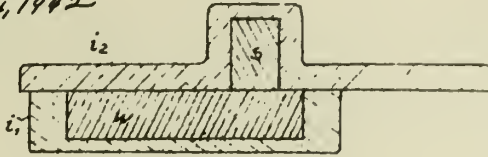


Fig. 15

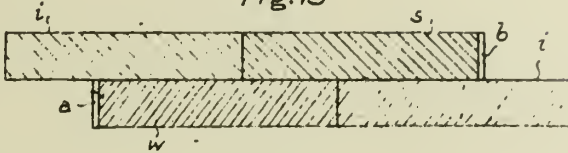


Fig. 16

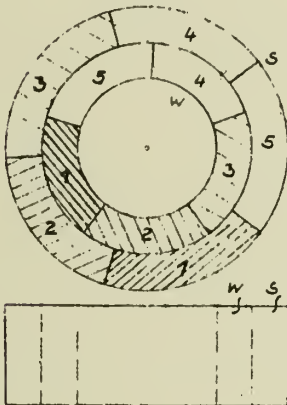


Fig. 17

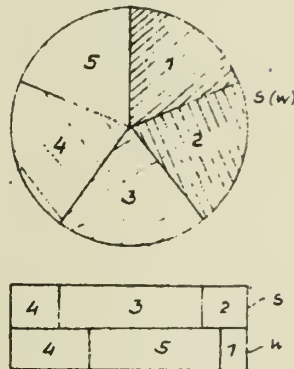
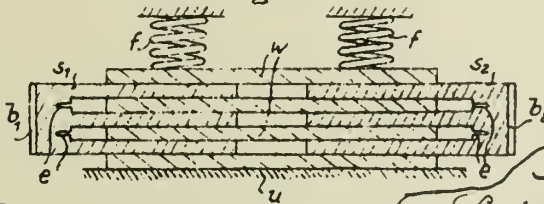


Fig. 18



*Inventor:*

*Rudolf Schade*

*By Richardson & Co. Attys.*

*49*



# ALIEN PROPERTY CUSTODIAN

## COMBINED CARBON AND METAL HOLDER BODY

Hans Zöllner, Lauf on the Pegnitz, Germany;  
vested in the Alien Property Custodian

Application filed June 12, 1940

This invention relates to a combined body of artificial carbon and a cast on or cast in metal holder which may be used, for instance, as a slide contact member, as a brake block, or for any other purposes.

It is an object of the present invention to provide a combined carbon and metal holder body which is so constructed that there are no dangerous mechanical tensions produced in the carbon body by changes of the working temperature within a wide range or by the shrinking of the metal casting as it cools down after the casting operation.

In the copending patent application Ser. No. 319,357, filed February 16, 1940, a combined carbon and metal holder body has been described in which the surface of the carbon body is formed with recesses, such as, bores, grooves and the like which are filled up by the metal casting.

Now, according to the present invention, I provide interior channels within the carbon body which are filled up by the molten metal in the casting operation. Said channels may be arranged in longitudinal, transverse, and/or diagonal or other directions.

The invention will be better understood by reference to the following detailed description in connection with the accompanying drawing showing two embodiments of the invention and in which:

Fig. 1 is a side view of a combined carbon and metal holder body having the invention applied thereto.

Fig. 2 is a section on line A—A of Fig. 1.

Fig. 3 is a side view of a modification and

Fig. 4 is a plan view of the embodiment of Fig. 3.

Referring now to the drawings in greater detail, and first to Figs. 1 and 2, it will be seen that a carbon body K has attached to it a cast metal holder G. Interior channels *b* in the carbon body K extending in substantially parallel directions with respect to the surface of the body

adjacent to the holder G communicate with said surface through a wide bore or hole Z and the bore Z as well as the channels *b* are filled up by the cast metal which flows into the channels *b* through the bore Z. Depending on the size and shape of the carbon body, a plurality of similar groups of channels and bores may be provided on various places of the carbon body, in communication with the metal casting.

It will be noted that the solidification of the metal that is poured into the said channels and bores proceeds from the outside to the interior, i. e., the ends *e* of the channels will cool down first and the solidification will proceed towards the "shrinking center" *z*. During this process, the charge in the channels *b* is constantly under the pressure from the metal which is still in molten state. As a result, a dense casting is attained, the channels are tightly filled up and the portions of the holder extending into the carbon body are fixedly secured therein without any dangerous tensions due to shrinking. Since the whole metal casting is produced in one casting operation, the plate-shaped holder portion G which serves as a support and fixing means for mounting the carbon body in its use is fixedly anchored in the carbon body and reliably connected therewith.

In order to mount the combined carbon and metal holder body on any other element, by means of a screw connection, interior threads *w* may be cut into the portion *z* of the metal casting, as indicated in Figs. 3 and 4 which for the rest show the same construction as Figs. 1 and 2.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

HANS ZÖLLNER.



PUBLISHED

MAY 18, 1943.

BY A. P. C.

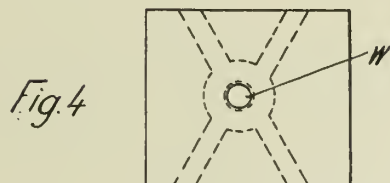
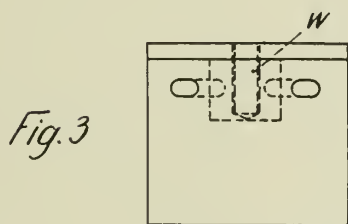
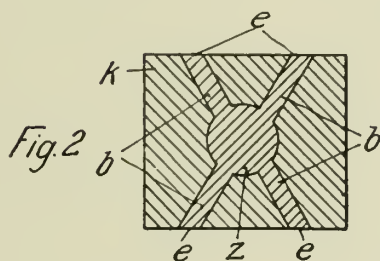
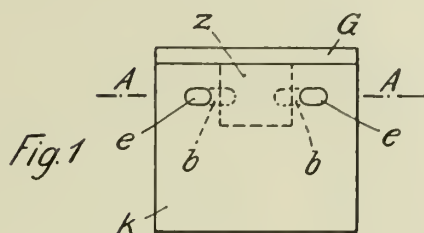
H. ZÖLLNER

COMBINED CARBON AND METAL HOLDER BODY

Filed June 12, 1940

Serial No.

340,223



Inventor:  
Hans Zöllner  
By *Young, Evey & Thompson*  
Attorneys



ALIEN PROPERTY CUSTODIAN

ELECTRODEPOSITION OF METALLIC COATINGS

Robert Weiner, Frankfurt A/Main, Germany;  
vested in the Alien Property Custodian

No Drawing. Application filed June 13, 1940

This invention relates to the electrodeposition of metallic coatings of, for instance, nickel, copper, chromium, silver, gold or the like on zinc alloys, particularly on zinc alloys with a high content of zinc, whereby an intermediate layer of white brass is applied to the zinc alloy. If desired, a pickling with an alkaline solution of zinc oxide may be carried out before the application of the intermediate layer.

It is known that zinc alloys with high contents of zinc, such as are known under the trademark "Zamak", containing a large quantity of zinc and minor quantities of other metals, preferably copper and light metals, such as aluminium and/or magnesium, give only very bad results when electrodeposited.

This is mainly due to the fact that such alloys rich in zinc are subjected in course of time to a recrystallisation phenomenon leading to changes in volume and consequently to an inferior capacity of adhesion of the coatings which tend to warp and to peel off.

According to my invention a way was found to coat these alloys with perfectly adhesive electrodepositions, for instance, of metals, such as nickel, copper, cadmium, chromium, silver, gold or their alloys, for instance, yellow brass. Thorough investigations yielded to the result that perfect and strongly adhesive coatings may be deposited on these zinc alloys or objects or parts of articles made therefrom, if an intermediate layer of white brass, preferably bright white brass (containing of about 10 to 30% Cu) is inserted between the zinc alloy and the final coating.

There are various methods and baths which may be used for the production of electrodeposited white brass or bright white brass coatings. Expediently the zinc alloy may be degreased as usual, for instance, with a treatment of soda lye or alkali lye or other degreasing means. If the degreasing is carried out electrolytically, the object to be treated may be suspended as cathode in a solution of carbonates, phosphates, cyanides or the like whereby the grease is saponified and lifted off through the evolving hydrogen. Thereafter a short pickling in diluted acids, preferably hydrochloric acid, is carried out. Sometimes it is also expedient to clean the surface mechanically, for instance, by brushing.

It has proved advantageous to subject articles from alloys with higher aluminium contents, for instance, more than 10%, to a further pickling with zinc oxide ("zinkate pickling") as it is

already known in the treatment of high percentage aluminium alloys. The previously treated objects are immersed for several seconds into an alkaline solution of zinc oxide and afterwards thoroughly rinsed with water.

Now the degreased, pickled and, if desired and necessary, mechanically brushed objects are thinly plated with white brass or bright white brass from a suitable bath. If a bright white brass bath is used for the formation of the intermediate layer, a simple rinsing of the coating is sufficient. The use of a white brass bath necessitates a common planishing treatment, for instance, with rotating steel brushes.

To the intermediate layer of white brass or bright white brass the final layer of, for instance, nickel, copper, chromium, silver, gold, yellow brass or the like is applied, according to the well known methods and baths.

In carrying out my invention I proceed, for instance, as follows: An object made from an alloy rich in zinc is electrolytically degreased, pickled with diluted hydrochloric acid (1:4) and treated for example 5 minutes in a white brass bath at suitable conditions, for instance, at a current density of 1 to 2 amp/dm<sup>2</sup>, hereby a thin coating, containing about 20% Cu, is deposited. After a short rinsing with water the final layer is produced, for instance, in such manner that the object is treated in a usual bright nickel bath with a current density of 1 amp/dm<sup>2</sup> for a time of about 30 minutes.

Examples

(1) Sheet strips 2.5 x 10 cm from a zinc alloy, containing 2.7% Cu, 4.0% Al, 0.03% Mg, rest zinc are treated at room temperature at a current density of 2 amp/dm<sup>2</sup> in a bright white brass bath during a period of 5 to 10 minutes. The bright white brass bath has the following composition:

	Grams
Zn (CN) <sub>2</sub> -----	60
NaCN -----	83
NaOH -----	78
CuCN -----	20
NaS -----	0.5
Piperonal -----	3
MoO <sub>3</sub> -----	8

To the intermediate coatings of bright white brass which have a thickness of 3 to 5μ, the desired final electrodeposits are applied as usual in a suitable electrodeposition bath.

(2) Zinc die casting strips of 1/4 qdm are electroplated at ordinary temperature with a current

density of 5 to 10 amp/dm<sup>2</sup> in a white brass bath containing the following substances:

	Grams
Zn (CN) <sub>2</sub> -----	60
Cu (CN)-----	20
NaCN -----	83
NaOH -----	80

To the intermediate layers having a thickness of about 2 to 4μ a smoothing aftertreatment is applied, if desired or necessary, whereupon the final coatings are electrodeposited.

According to my invention coatings of perfect adhesion are obtained.

Investigations made with sheets which were treated according to my invention, having an intermediate layer of white brass or bright white brass and a final coating of nickel or copper, have shown that after a one month storage in drying ovens at a temperature of about 95 to 100° C the sheets were entirely unharmed, i. e. no warpage was to be seen. A treatment of several hours in a steam vessel at 1 and 2 atm. excess pressure revealed no defects either. It is now possible to apply strongly adhesive perfect coatings to zinc die casting alloys which hitherto could not be electrogalvanized with stable deposits.

ROBERT WEINER.

# ALIEN PROPERTY CUSTODIAN

## METHOD OF ELECTROLYTICALLY OBTAINING MAGNESIUM

Hans Grothe, Clausthal-Zellerfeld I, Germany;  
vested in the Alien Property Custodian

No Drawing. Application filed June 13, 1940

The present invention relates to a method of electrolytically obtaining magnesium.

In obtaining magnesium by a molten metal electrolysis of a salt mixture containing chloride of magnesium, usually carnallite, a mineral consisting of chloride of potassium and chloride of magnesium, the separated magnesium, due to its low specific weight, rises to the upper surface of the bath. The danger then exists of recombining with the simultaneously separated chlorine at the anode, or of absorption of other substances. The raw magnesium so produced usually must subsequently be subjected to a purifying method. The necessity of separately collecting the products rising from both electrodes requires the use of special apparatus which at the operating temperatures of 7-800° C. are rather complicated and expensive. If, without substantially increasing the operating costs, it is possible to separate the magnesium at the bottom of the electrolyzing cell not only the total structure of the operating cell would be substantially simplified and its manufacturing costs reduced, but the separated metal would be purer and of higher value. By using a cathode of a special heavier metal or an alloy which is liquid at the operating temperature and sufficiently tends to solve with regard to magnesium, such as lead, aluminium etc., it is well known to absorb the magnesium in this bottom metal and then either to separate it again in a second operating phase or to directly use the alloy produced. When using aluminium or aluminium-magnesium-alloys respectively as cathode the enrichment of magnesium is limited, because with an increase of the magnesium contents the density of this alloy approaches that of the carnallite melt and the danger of floating or rising respectively exists. It is evident to obviate this draw-back by adding to the melt substances which are specifically light and harmless for carrying out the electrolysis. Such substances particularly proposed for this purpose are chloride of potassium and chloride of magnesium respectively.

A mixture of chloride of potassium and chloride of magnesium having a temperature of 750° C. has the same density than liquid magnesium if the contents of chloride of potassium in the melt amount to 80%. For maintaining a sufficient density difference of at least 90% of chlo-

ride of potassium of a temperature of 750° C. must be maintained. At a lower temperature the necessary minimum concentration in chloride of potassium is correspondingly higher, because the chlorides have a greater temperature coefficient for the change in density than the magnesium. The low concentration of chloride of magnesium then excludes an electrolysis at the economically desirable high current densities; the higher operating temperature causes disturbances due to the then already perceptible vapor pressure of the magnesium (of about 25 mm. Hg) so that this proposal could not lead to a practical use. The use of sodium chloride has similar effects but in this case the separation of the sodium cannot be prevented due to the lower decomposition tension. For the same reason the very light lithium chloride has been considered as useless in the literature.

Now, it has been found that in contradistinction to this hitherto prevailing point of view lithium chloride is excellently useful. If it is desired for instance to obtain pure magnesium from a melt containing 30% chloride of magnesium, 40% chloride of potassium and 30% chloride of lithium, the temperature of the bath is maintained within 670 to 720° C. The magnesium then separated contains no potassium and at the most traces of lithium and, moreover, is free of non-metallic admixtures.

Without danger the composition of the melt bath may be varied within large limits. Care only must be taken that the density of the melt at the selected operating temperature lies sufficiently below that of the molten magnesium. Of course, the impoverishment of chloride of magnesium must not be too large particularly not at the higher current densities. Even with 10% of chloride of magnesium and 50% of chloride of lithium only no higher lithium content in the separated magnesium was ascertained.

To prevent foreign substances mechanically entered into the bath or heavier oxides and the like formed during melting to enter the metal of the cathode or to reach the upper surface of the latter, the melt preferably is completely purified and cleared in a suitable manner before the electrolytic decomposition starts.

HANS GROTHE.



# ALIEN PROPERTY CUSTODIAN

## ARRANGEMENT FOR TRANSMITTING MESSAGES WITH THE AID OF LINE-DIRECTED CARRIER FREQUENCY CURRENTS

Leon Ladislas de Kramolin, Gross-Glienicke, Berlin-Kladow, Germany; vested in the Alien Property Custodian

Application filed June 14, 1940

The present application relates to an arrangement for transmitting messages with the aid of line-directed carrier frequency currents, particularly to an arrangement of this kind for transmitting messages in a building, in adjoining buildings or in a group of buildings belonging to an enterprise.

Hitherto, it was the custom with such private telephone installations to use exclusively telephone apparatus connected by special individual lines and the simplest way of calling or communicating with different stations was by special arranged signals or by a line-finder device which, in extensive installations, had the very great disadvantage that each telephone connected to the system required a special line to each individual telephone, making it necessary to have a considerable number of lines connected to each telephone.

In order to obviate this disadvantage, an automatic telephone exchange was often provided which, however, constituted an expensive installation.

During the last few years these disadvantages were more and more obviated, especially in the United States of America, by introducing a carrier frequency system using existing private lines, including strong current lines, for transmitting carrier currents so that no special lines were required or it was sufficient to install one single wire to which the individual stations were connected.

In this case, the selection of different stations was effected with the aid of tuning devices, each connected station having a certain length of wave for receiving, and the station desiring to communicate with a certain other station transmitted a carrier frequency tuned to the station at the other end.

However, this system has various disadvantages which prevent its introduction in a large number of European countries.

In order to ensure a reliable communication between the stations, the transmitted energy must not be too small.

Consequently, the comparatively strong signals required cause considerable disturbances of adjoining installations, particularly wireless apparatus, and furthermore it is difficult to accommodate several separate installations in a building so as not to disturb each other.

For example, if the offices of one firm are in the first floor of a building and another firm has its offices in the third floor, this type of installation makes it very difficult for the offices of each

firm to communicate in a satisfactory manner and to prevent the transmission of communications from the system of the one firm to that of the other, in case it is necessary to use substantially equal wave lengths in both systems, which generally will occur owing to the limited number of channels available. It is also necessary to consider that, with the known systems, the individual channels must not be too near to each other in the scale of frequencies as, for economy's sake, the individual receiving devices cannot operate with a very great selectivity.

According to the present invention, these disadvantages will be avoided by replacing the usual amplitude modulation in such line-directed carrier frequency systems by the phase or frequency modulation, known per se.

Thus, the following advantages are obtained:

As in the case of frequency or phase modulation, for obtaining a certain receiving intensity of sound with otherwise equal conditions, only about one quarter of the emitted energy is required, like with the amplitude modulation, the possibility of disturbing other devices, especially wireless apparatus in the neighbourhood, is considerably reduced, even with equally good conditions of communication between the individual stations. Apart from this, the probability of disturbing near wireless apparatus is also considerably reduced by the difference between the modulation in wireless apparatus etc. and the frequency or phase modulation, as installations, such as wireless apparatus etc., are not adapted to receive phase or frequency signals and will, therefore, respond to such signals in a very limited degree.

A further advantage of the device according to the invention is the known demodulating property of frequency modulated signals.

If a more intensive frequency modulating signal encounters a weaker frequency modulating signal, a difference in amplitude of about 1:3 or 1:4 between the two signals is sufficient to securely eliminate the weaker signal and to ensure an undisturbed reception of the more intensive signal. This means, however, that for ensuring a separation of the various individual channels in such a private telephone system, considerably shorter distances between the individual channels are sufficient in the scale of frequencies.

As in such systems it is not the question of transmitting music or the like in a first class manner, and as it is only necessary to ensure a good communication, a width of about 5000 kHz.

for a channel will generally be perfectly sufficient so that in using, for example, the comparatively long wave band of about 100 to 150 kHzs., this could contain about 10 channels, which should be sufficient for most purposes.

Though the band widths occurring in frequency modulation may be broader than the corresponding band widths in amplitude modulation, this is no special disadvantage in the present case, as, even if such outer bands should occur in a nearer or more remote neighbouring channel, they will not disturb if this neighbouring channel is used at the same time, because the above mentioned demodulating effects of a stronger signal upon a weaker signal will suppress the disturbance in a high degree.

In order that temporarily not used nearer or more remote neighbouring channels should not be disturbed by such more remote or nearer side bands, it is preferable, at least while a channel is not used, to protect receiving or call signals receiving devices connected to this channel by a certain negative liminal voltage of the tubes used therein or of a portion of same, or by other devices responding only to impulses exceeding a certain limit (for example current limiting connections, or noise eliminating devices, or capacitors constructed along the line of a copper oxide or selenium photo cell, or glow tubes, polarizing cells, biasing triodes or similar arrangements) so that such side bands will not have a detrimental effect.

In this manner, or by means of devices which will only let one side band pass through whereas the other side band is suppressed (which also may be advantageous in applying amplitude modulation in the present case), it is possible to accommodate quite a number of communication channels in a comparatively narrow frequency band.

If the entire frequency band utilized by the system amounts to only about 50 kHz. for about 10 channels, i. e. in the case of the present constructional example 100 to 150 kHz., it is also easily possible to provide an effective blocking in this comparatively narrow frequency band against these high frequency carrier currents at the points where the carrier wires, for example the electric strong current line, leave the respective building or offices.

If, in order to avoid the expenses of a highly selective arrangement and to prevent mutual disturbances of the individual channels in the older types of installations with amplitude modulation, it should be necessary to adhere to a distance of up to 20 kHz. between the individual channels, this, in the case of 10 channels, would require a total wide of about 200 kHz., and naturally an effective blocking, for example at the meter of the strong current line, would be extremely complicated.

If mere chokers are used for blocking, the great width of the band of about 200 kHz. in the case of the present constructional example, i. e. of a frequency band of 100 to 300 kHz., will be realized but very imperfectly.

However, if the width of the band is reduced to 50 kHz., a somewhat more damped single oscillation circuit or two highly coupled circuits will be sufficient to ensure a very effective blocking of such a line for the frequency used. An arrangement as shown in Fig. 1 may serve as a very effective blocking system.

In the present case, I and II are the two main lines of a strong current installation.

Two oscillation circuits *a* and *b* are, for example, tuned to a mean frequency of the frequency band used (for example with 100 to 150 kHz. about 125 kHz.

The various private telephone instruments may, for example, be connected at the side of the line installation indicated by a double arrow.

By means of the mutual inductance of the circuits *a*, *b*, and the condensers C1 and C2, a coupling is obtained (if necessary, for example if C1 and C2 require too high a coupling, the inductive coupling and the capacitive coupling may act opposite to each other) in such a way that the resonance curve of the arrangement will have a form similar to that shown in Fig. 2, the width being so as to approximately correspond to that of the total band.

The series resonance circuit C3, L3 may also be assumed to be tuned to the mean frequency of about 125 kHz.

Such a simple and cheap arrangement is in a position to very effectively suppress the comparatively narrow frequency band of a width of 50 kHz. and also to suppress disturbances of a neighbouring similar carrier frequency system as well as of neighbouring wireless apparatus.

The conditions will be still more favourable if higher frequencies are used, for example between 300 and 600 kHz.

Although the arrangement according to the invention, as shown in Figs. 1 and 2, is particularly suitable for the carrier frequency system described above, its application to amplitude modulated systems, especially with only one side band, shall not be excluded.

The effectiveness of the arrangement according to the invention may also be assisted by using, especially at the receiving end, electro-mechanical resonators as resonance bodies.

With the frequencies mentioned in the present constructional examples of about 100 to 150 kHz. it is possible to use electro-mechanically excited oscillators of steel or the like (either by pure attraction between an armature and a high frequency magnet or by electro-stricture resonators) in which, with a certain amount of feed back via a tube, the sensitivity may be considerably increased.

In case it is necessary, artificial damping should be applied in order that the speaking frequency band picked up is not too narrow.

By means of compensating devices, known per se, which will be mentioned below, the cutting of the side bands may be partly compensated in an effective manner.

Instead of the usual magnetic resonators it is possible to use such of non-magnetic material, such as glass, quartz, ceramic material or the like, if they are provided with magnetically or electrostatically effective parts so that the high frequency magnetic action of a coil may exert a mechanical effect upon them or so that the electro-static effects of a condenser may be transmitted to them by electro-static mechanical attraction.

As resonators, it is also possible to use piezo-electric crystals or other bodies in a manner known per se.

Apart from quartz, tourmaline, etc., Seignette salt is also suitable for this purpose.

In this case, the mechanical motion of the resonator, i. e. either an oscillating magnetic or a magnetic-stricture body, or a piezo-electric body or the like, may directly serve for sound production.

For this purpose, the respective body, i. e. either one of the first mentioned magnetically effective bodies or, for example, a Seignette salt body, may be connected in a suitable manner, known per se, to a loudspeaker diaphragm or the like.

With a suitable arrangement, it is also possible that the amplitude variations of the oscillating crystal or other oscillating body are transmitted to the loudspeaker or other telephone diaphragm and are there heard as sounds.

The coupling between the oscillating material, i. e. for example the Seignette salt crystal and the loudspeaker diaphragm, may be constructed so as to act like a mechanical low pass filter and, therefore, not to transmit the high frequency oscillations in a considerable degree to the diaphragm, whereas the low frequency amplitude variations, which are within the range of hearing, reach the diaphragm and cause it to resonate.

By a suitable arrangement of the loudspeaker resonances so as to prefer high frequencies, which, if necessary, may also be assisted by electric tuning to high sound frequencies, and by corresponding high frequency arrangements, known per se, (preference of high frequencies being also obtained by using screen grid tubes and pentodes and the like for sound amplification), it is possible to prevent cutting of the side bands by too high a selectivity of the mechanical resonators.

If a preliminary amplification is used, which is practically aperiodic, letting at least the received frequency band pass practically uniformly, it is possible that, if using an electro-mechanic resonator, i. e. for example a Seignette salt crystal, it may at the same time serve as tuning instrument of the receiving device and also as demodulating device for the frequency modulation and as driving part of the reproduction instrument, (for example the loudspeaker).

If, by means of a speaking or hearing switch, it is intended to speak and hear alternately, the same electro-mechanical instrument may also serve as microphone, for example so that, by means of an ordinary or an electro-mechanically fed back tube oscillating device, the respective electro-mechanical resonator is kept oscillating, the speaking oscillations touching the diaphragm, causing varied mechanical stresses in the respective resonator, such as a Seignette salt crystal, whose natural oscillation is varied, thereby modulating the frequency of the emitted high frequency oscillations or at least of their position of phase.

If it is desired to use a mere phase modulation instead of a frequency modulation, it will be advisable, in the present case, to follow the instructions given in the German Letters Patent No. 670,306 of the applicant, in which case the total frequency band required for a certain number of channels may be considerably reduced.

The synchronizing frequency required or at least advisable in this case may lie in any free band and may be entirely different from the band comprised by the individual communicating channels. The highest possible harmonic of the current in the strong current line may, for example, serve as synchronizing frequency.

If a loudspeaker, independent of the electric resonator, is used, it is advisable, as mentioned above, to have the loudspeaker tuned as high as possible for compensating side band losses.

For this purpose, a loudspeaker according to German Letters Patent No. 638,181 (Kramollin and Masché) has proved to be suitable, because electro-static loudspeakers very much favour high frequencies, and if they are excited by an accordingly connected pentode as loudspeaker tube, they will very considerably favour high frequencies.

If the modulation is not effected as mentioned above by direct acoustical influence, but if either a separate microphone is used for speaking or if a constructional part, such as a Seignette salt crystal acting as electro-mechanical oscillator in receiving connection, is used in transmitting merely as electro-static microphone, or if a constructional part operating in listening position serves as electro-dynamical loudspeaker in transmitting, a special constructional part is required for effecting a frequency or phase modulation.

Such a constructional part may be premagnetizable ferro-magnetic cores, altering the self-inductance or mutual inductance of high frequency coils which co-operate with the premagnetizable ferro-magnetic core.

Devices of this kind are, for example, described in the British Letters Patent Nos. 449,240, 451,097 of the undersigned.

The premagnetizing windings of such a premagnetizable iron core may be used for frequency or phase modulation as well as for tuning to different lengths of communication waves by providing, for example, a premagnetizing current selectively variable by different push button switches or the like, but being fixed while communicating with another station, the premagnetizing current effecting the tuning to a certain communication channel, whereas, apart from these operating but fixed current values, adjustable by a push button and corresponding to different communication channels, there are superposed in a special exciting coil or in the same exciting coil other suitably weaker varying currents, originating either directly or after being amplified from a microphone and, therefore causing frequency or phase variations in tune with the speaking oscillations to be transmitted.

Instead of such magnetic influencing devices it is also possible to use various electro-static influencing devices, for example as described in the British Letters Patent Nos. 451,098 and 501,238 for modulating as well as for tuning purposes.

The tuning and modulating variations by varying the values of a direct current or by other devices operatable from a distance have the further considerable advantage that the casing containing the amplification tube need not be placed on writing tables in offices, where they take up too much room owing to their comparatively large dimensions and also because they develop heat, but they may be arranged anywhere near the speaking apparatus on the wall or beneath a table so that only the actual speaking apparatus and a comparatively small casing containing the operating buttons and the like are placed on the table of the operator.

With instruments as those described above, which effect the tuning by varying the current value of a tuning current (for example a premagnetizing current), but also in cases where such devices are used for phase or frequency modulation, it is very desirable that the voltages or currents used should remain constant at least as far as they influence the tuning elements.

For this purpose it is advisable to provide stabilizing devices.

These stabilizing devices may, in a manner known per se, consist of combinations of resistances with more or less positive or negative temperature coefficients or of combinations of resistances with negative and positive temperature coefficients, or there may be used glow tubes or tubes with saturation characteristic for this purpose, or devices according to British Letters Patent No. 449,049 (Schottky), or also stray or saturation transformers and chokers of the type of the known voltage regulator by Siemens.

However, in most cases a device described by the applicant at another occasion is the most suitable for this purpose, owing to its simplicity and cheapness, in which the respective modulating or tuning arrangement is supplied with the anode current of a tube with a very low magnification factor.

For this purpose, screen grids or other multiple grid tubes are suitable, whose positive grid biases, i. e. especially the screen grid voltages of a glow tube or any other stabilizing device, is tapped by connecting between the anode voltage lead of a series connection of a resistance, having no considerable temperature coefficient, and a glow tube, the latter being connected with respect to said screen grid tube or pentode at the side of the cathode and the screen grid lying at the connecting point of the resistance and the glow tube.

Such an arrangement also has the further advantage that occasional voltage impulses in the line will not cause a disturbing noise. This effect may be further increased if the heating voltage of the tubes is at the same time reduced a little so that only when a speaking switch is operated, such as by taking off a receiver or microphone from a hook or stand, the full anode or heating current will automatically become effective.

Apart from the advantages just mentioned, such a method has the further advantage that, in the state of repose, less heat is developed, the consumption of energy is reduced and the life of the tubes is lengthened.

But all the same, it must be seen to that the call signal arrives well.

In order to ensure this, it is advisable, especially in the last mentioned case, to connect, by an automatic switching operation to the loudspeaker circuit and to any preliminary circuits, tuning elements in preliminary stages of a reduction of the absorption of energy by the tubes, so that there will be in the loudspeaker circuit and in any such preliminary circuits an acoustic as well as (in the respective circuits) a highly frequent frequency characteristic, ensuring that, also with reduced absorption of energy by the tubes, such a call signal will arrive in a satisfactory manner.

For example, the tube acting as high frequency generator tube, when speaking, may be connected and arranged in the state of repose in such a way that it will seize to oscillate owing to the reduction of the energy supplied, but will then constitute a fed back and, therefore, highly sensitive receiving instrument tuned to an arriving signal of the correct frequency. This feed back or tuning may be of high or low frequency according to circumstances. One tube may also be fed back at high frequency (but suitably not oscillating) adjusted to a receiving signal, whereas one tube, suitably located behind the demodulator and fed back as well as tuned at low frequency but not oscillating, may be prepared to receive the call signal arriving with the correct frequency.

The applicant desires a protection for each of the constructional examples described or mentioned above as well as of any combination thereof.

LEON LADISLAS DE KRAMOLIN.

PUBLISHED  
MAY 18, 1943.  
BY A. P. C.

L. L. DE KRAMOLIN  
ARRANGEMENT FOR TRANSMITTING MESSAGES WITH  
THE AID OF LINE-DIRECTED CARRIER  
FREQUENCY CURRENTS  
Filed June 14, 1940

Serial No.  
340,599

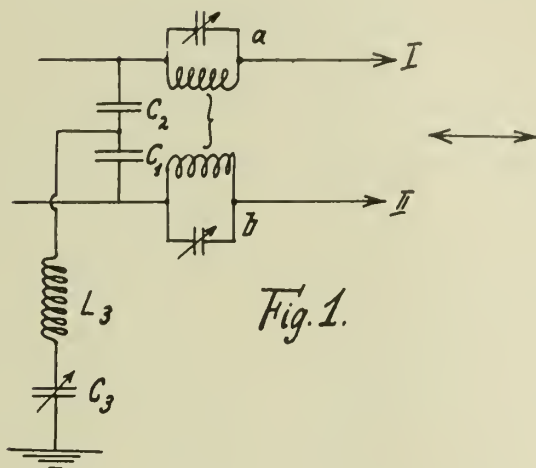


Fig. 1.

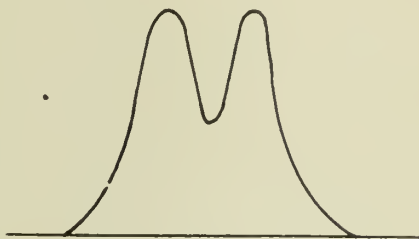


Fig. 2.

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# ALIEN PROPERTY CUSTODIAN

## BUSHING INSULATORS

Vítězslav Havlíček, Pilsen, Bohemia; vested in  
the Alien Property Custodian

Application filed June 15, 1940

My invention relates to bushing insulators for lead-in conductor and has for its object to provide a bushing which would allow conduction of electric current of high voltage and intensity into a space containing a high-pressure medium. Hitherto, this object could not be achieved as the known bushings invariably failed when the task was to carry currents of high voltage and intensity into a space exposed to high-pressure e. g. such of several thousand atmospheres.

The way how my invention is carried out is hereinafter particularly described with reference to the accompanying drawing which represents a sectional elevation of the bushing insulator.

In the illustrated case, the interior space filled with a high-pressure medium, into which the current should be carried, is embodied directly in the bushing insulator and is indicated by letter P in the drawing. The dielectric material 1 of the bushing insulator is of plastic or semiplastic character (such as known under the trade name "Glyptal," "mycalex" and other) and contains metallic rings e. g. steel rings 2 embedded therein, the diameter and dimensions of these rings being determined by the pressure prevailing in the space P. The layers of the dielectric material 1 between the individual rings 2 are comparatively thin, comporting a thickness of only some tenths of millimeter up to one or more millimeters. However, it is necessary that these layers adhere perfectly to the rings 2.

The effect of this arrangement is that the stresses caused by the high pressure in the interior are carried by the metal rings 2 and the dielectric material 1 is relieved from these stresses, especially with view to its plastic properties.

In the direction of its longitudinal axis the bushing is clamped and rigidly held by means of nuts and bolts 3. The leak-proofness of the high-pressure space P between the individual rings 2 and the dielectric layers 1 is ascertained by a continuous inner layer of dielectric material which covers and adheres perfectly to the inner wall of the rings 2 and distributes evenly the inside pressure to the individual rings forming the support of this layer.

The said cylindrical inner layer may form a coherent body with the thin layer between the rings 2. The thin layers between the rings 2 may, however, be also constituted by a material different from that which is used for the cylindrical inner layer.

The clamping force of the bolts 3 is transmitted to the bushing body by means of metallic parts 4 and insulator parts 5. The conductors or electrodes 6 pass through the metallic part 4 without insulation and are packed therein by a known method (e. g. by the method of Prof. Bridgeman). The movable insert 9 exposed to the inner pressure presses the rubber packing 10 towards the ring 11, which is supported by the screw 12.

The distribution of the electric potential in the individual dielectric layers of the bushing can also be improved by electrostatic screening. Supposing e. g. that the lower electrode is connected to the earth and high potential current is brought to the upper electrode, the electrostatic screening may take the form of a conical metal screen 13 shown in dotted lines in the figure. The screen 13 is connected to the upper electrode and it distributes evenly the capacity current of the layers directed towards the earth-connected lower electrode.

The part of the bushing containing the dielectric layers as well as the screening cone may also be submerged in oil bath in case of a very high potential. Instead of the continuous conical face, separate screening rings surrounding the dielectric layers of the bushing may be used, these rings being connected electrostatically with the upper electrode and between each other and having enlarging diameters towards the lower end of the bushing.

The pressure medium may be admitted into the space 7 through the opening 8 provided in the metallic part 4. Various other apertures, such as control and pressure-gage connections may be arranged in the part 4 according to the need.

VÍTĚZSLAV HAVLÍČEK.



PUBLISHED

MAY 18, 1943.

BY A. P. C.

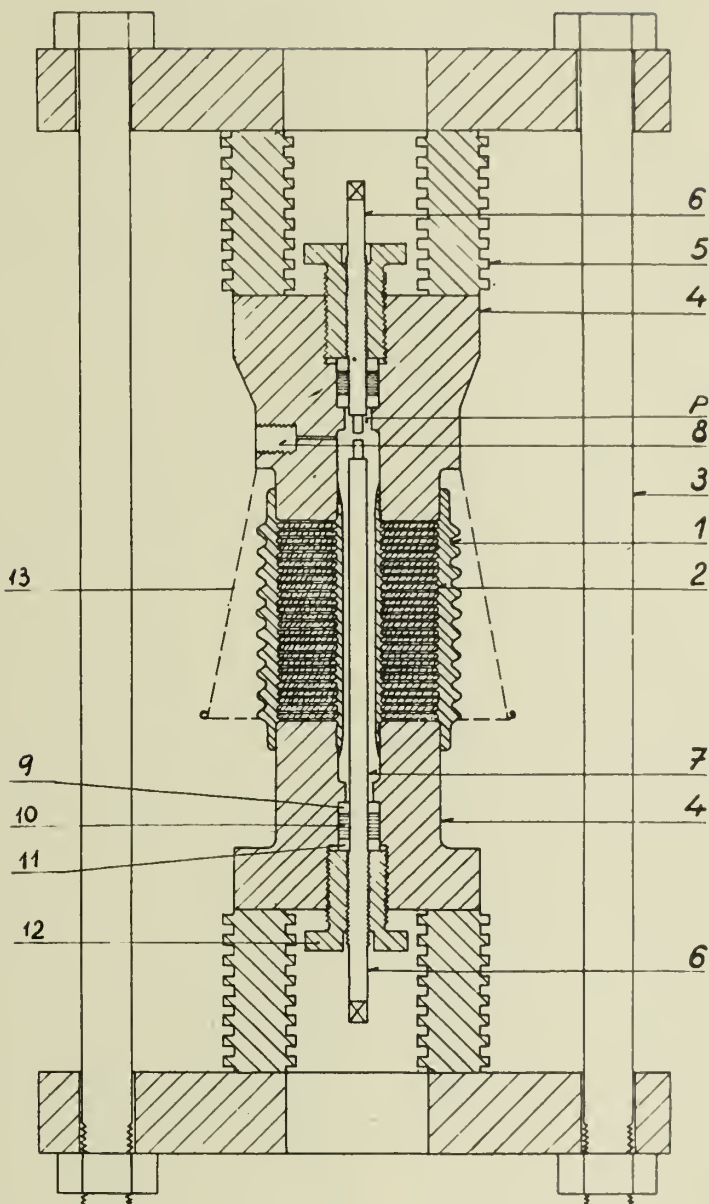
V. HAVLICEK

BUSHING INSULATORS

Filed June 15, 1940

Serial No.

340,675



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BY *Haseltine, Lake & Co.*  
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# ALIEN PROPERTY CUSTODIAN

## FRICTIONAL ADHERENCE CONNECTION BETWEEN THE CELLS OF ELECTRIC STORAGE BATTERIES

Giacomo Azzaroli, Lugo, Italy; vested in the Alien Property Custodian

Application filed June 15, 1940

It is a well-known fact that one of the drawbacks connected with storage batteries is due to the difficulty of demounting the elements or cells composing same, which difficulty is owing to the fact that even nowadays the connection between the several cells is effected by means of soldering. The means proposed in order to the avoiding of soldering have not up to this time yielded any practical result.

Therefore, every time demounting is desired to be carried out, the detachment, viz. the unsoldering of all the connections is called for. This cannot be done except by specialized workmen and requires a certain length of time.

Besides, the remounting also calls for skill and time, as fresh solderings have to be provided for.

All this leads to a considerable increase of the cost and of the working expenses of storage batteries.

The invention forming the object of the present specification aims at obviating the said drawback and it is based on the fact of the connection between the cells being provided for by means of connecting bridges, cast in ductile metal as in a lead-antimony alloy, provided with two recesses, being slightly conical and with a blind base, apt to receive the poles of two contiguous cells, the said poles being constituted by a solid of a shape corresponding to the recesses and composed of a metal of the same alloy as the connections. The invention constitutes an application of the mechanical law according to which the friction between adherent bodies is evolved to the utmost degree between homogeneous bodies. In the case in question, where we meet with an alloy having minimum hardness and ductility, a moderate degree of pressure exerted once only on the connections, and at the moment of the composition of the battery, determines in virtue of the said physical principle, a perfect adherence between the connected parts, without the feared discontinuities within the electric means, which discontinuities are capable of determining the formation of electrolytic salts, while any increase of resistance or loss of tension is avoided. According to the present method, solderings are therefore superfluous, such as otherwise deemed necessary.

The foregoing mechanical law of friction, although known, had not up to the present time been applied to the specific case, the value of same having no doubt been considered insuffi-

cient to determine an adherence capable of resisting the mechanical strains to which a storage battery mounted on a motor vehicle is subjected; and it had, furthermore, been—erroneously—believed that electrolytic de-compositions would occur, with the formation of salts, and a consequent loss of tension.

Severe and rigorously conducted tests have proved with certainty the advantageous applicability of the said law, which advantages find their concrete expression in a simplification of the battery construction, in the ensuing lower cost thereof and in the prerogative acquired by the said batteries as constructed according to the said method, of the ease of regenerating same in such parts as are liable to wear out in a comparatively short time, a considerable percentage of materials being thus preserved from loss.

The invention will be best understood on following the accompanying drawing, which shows a practical example of the carrying out of the said invention. In this drawing—

Fig. 1 shows in a side view two plates of battery elements or cells with their relative connections in section;

Fig. 2 shows the same plates in a front view with one connection in section;

Fig. 3 shows the same plates in a plan view with the relative connections.

According to the example delineated, the small plate *a* carrying the positive plates is provided at its upper part with a slightly conical knob *b*.

The connection between two contiguous cells is effected by means of a bridge *c* carrying on either side a hollow seat *e'* into which the knob *b* fits, which latter after having once been pressed into the said seat, remains firmly engaged therein through adherence. An annular depression *d* is provided around the edge of each hollow seat *e'*; and same fulfills the purpose of preventing any eventual jets of liquid from above from reaching the base of the contact surfaces of the connections.

The knobs are inserted into holes provided in the cover *f* of the battery; thereupon the cover is secured to the knobs by means of nuts *g* screwed upon the screw-thread *b'* carried by the said knobs.

The knobs and also the connections, which are made of ductile material, may be provided with a core of more resistant material.

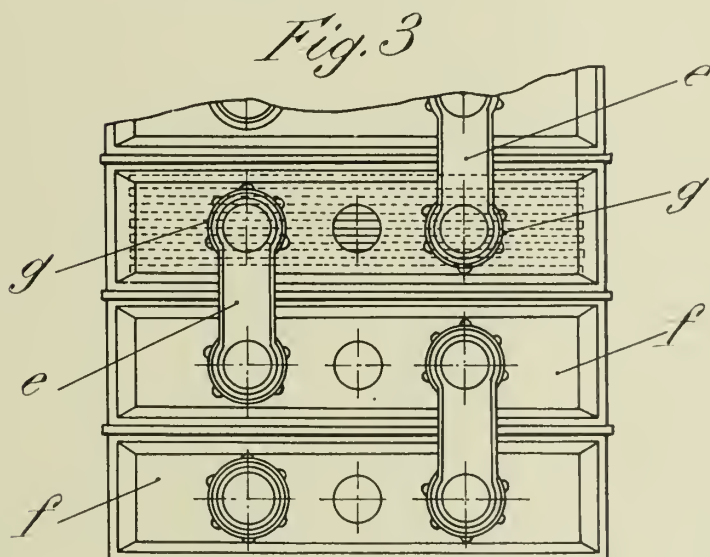
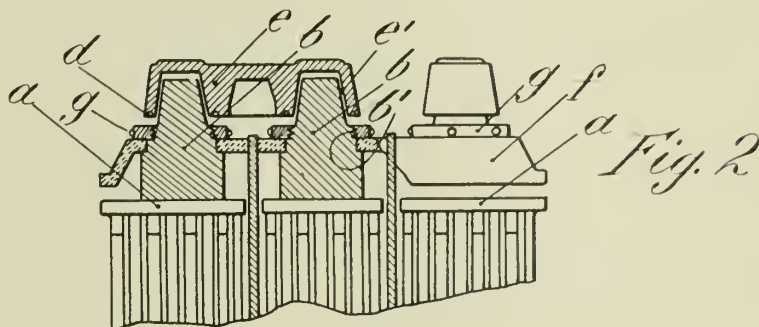
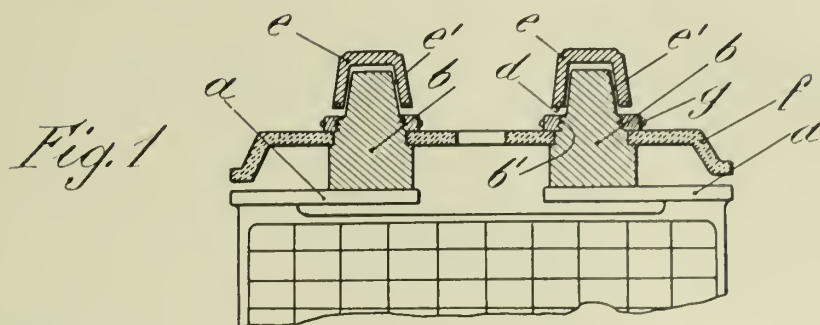
GIACOMO AZZAROLI.



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BY A. P. C.

G. AZZAROLI  
FRICTIONAL ADHERENCE CONNECTION BETWEEN  
THE CELLS OF ELECTRIC STORAGE BATTERIES  
Filed June 15, 1940

Serial No.  
340,686



Giacomo Azzaroli  
INVENTOR

By *[Signature]*  
His ATT'Y.



# ALIEN PROPERTY CUSTODIAN

## APPARATUS FOR THE ELECTRONIC TREATMENT OF LIQUIDS

André Jean Barbier, Paris, France; vested in the Alien Property Custodian

Application filed June 15, 1940

The object of the present invention is to provide apparatus for the treatment of liquids by electronic means with a view to accelerating the precipitation of certain impurities, without the invention of the vessel containing the liquid, this vessel admitting of being made of any material, for instance, glass.

Apparatus and plant enabling the aforementioned object to be attained exhibit the characteristics set forth in the ensuing description and more particularly defined in the claims appended thereto.

Installations according to the invention are illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a view of a glass vessel provided with a device according to the invention:

Figure 2 is a plan view of this device.

Figure 3 is a section of the emitter of the installation shown in Figures 1 and 2.

Figures 4 and 5 are explanatory diagrams of the electrostatic phenomena that occur in the installation shown in Figures 1 and 2.

Figure 6 shows in sectional elevation a water chamber or column provided with the device according to the invention.

Figure 7 is a plan view of this water chamber.

Figure 8 is a view on a larger scale of a grid mounted in this water chamber.

Figures 9 and 10 are views in elevation and in plan respectively of another water chamber or column according to the invention.

Figure 11 shows in elevation a grid mounted in the installation of Figures 9 and 10.

Figure 12 shows in sectional elevation a vessel with rounded ends containing hot water and provided with the device according to the invention.

Figure 13 is a diagram of another installation according to the invention.

The plan illustrated in Figures 1 to 5 comprises a glass vessel 1 with a removable cover 2 and an outlet cock 3 for the treated water.

An electron emitter 4 is suspended by a wire 5 through the medium of an insulator 6 from the neck 7 at the top of the vessel.

This electron emitter, which is carried to a potential V, may be of any convenient type, and in particular it may be constituted, as indicated in detail in Figure 3, by a casing 8 having a certain coefficient of absorption which depends upon the nature and mass of the casing itself. Hence this casing acts as a wire-drawing cell according to the emissions desired.

This casing contains a roasted and absorbent vegetable product, such as wood charcoal, this

vegetable product being impregnated with an organic liquid, for instance ethyl alcohol extracted from garlic.

The mass of vegetable product thus constituted is held in place by two covers 8<sub>1</sub> and 8<sub>2</sub>, which grip this mass between them and are soldered to the casing 8.

The mass as a whole, thus constituted, is initially charged with negative electricity, so that the whole of the mass is carried to a substantial potential V.

On the other hand a screen grid 10 is immersed in the liquid facing the emitter 4. This grid may consist for example of a plate of highly conductive metal. In this way a screen is obtained, which, owing to its conductivity and its coefficient of absorption, can be traversed by the electrons, thereby justifying the description of it as a grid.

The grid 10 is suspended from the neck 7 of the vessel 1 by a wire 11, which in its turn is attached to a connecting strip 12, which is earthed at 13 by a wire 14 of metal having a very low resistance, such as a copper. It will obviously be an advantage to construct the connections 11 and 14 by the use of a wire of minimum specific resistance, such as a wire of drawn copper, the specific resistance of which is about 1.6 microhms per square centimeter.

Similarly it is advantageous, in order to reduce the resistance of the connections 11, 12 and 14, to arrange the vessel 1 as close to the ground as possible, in order to reduce to a minimum the length of the connecting wires 11, 12 and 14.

Finally, it is very important to select moist vegetable mold, this moisture being due to the quality of the ground itself. Copper wires embedded in the ground to depths of from 1 to 5 metres may for example be employed.

The various conditions mentioned above cooperate with one another to bring the screen grid 10 to a potential very close to the zero potential of the earth. The potential difference between the emitter 4 and the grid 10 is therefore substantially equal to the potential difference between this emitter and the earth.

In this way a very active emission of electrons are obtained from this emitter to the grid through the liquid mass.

The electric field thus constituted in the interior of the mass of liquid augments the force of repulsion of the electrons arranged around each atom, so that these electrons move further away from one another, thereby modifying the architecture of the atom. The electrostatic phenom-

enon thus produced is clearly illustrated in Figures 4 and 5, which represent the atom and its rampart of electrons, before and after the treatment of the liquid mass by means of the emitter and grid.

Under this electrostatic action certain impurities will be precipitated from the molecular mass of the liquid and will thus be able to be climinated.

It will obviously be possible to regulate at will the distance between the emitter 4 and the grid 10 according to the conductivity of the liquid treated and to the potential difference between the emitter 4 and the screen grid 10. The electromotive force  $E$  between this emitter and this grid is inversely proportional to the square of the distance  $d$  between them.

It is obvious that dissociation effects of the components of the water will be obtained, these effects being the more active as the energy of the electrified particles itself becomes greater. These dissociation effects will therefore be accelerated as a function of the mass and of the velocity of these electrified particles, in accordance with the known law  $E=mv$ , in which  $E$  represents energy of the electrified particles,  $m$  represents their mass, and  $v$  represents the velocity of these particles.

In order to investigate the results obtained with the water treated, the operation may for example be carried out in the following manner:

1 cubic centimeter of a 4% solution of sodium oxalate is precipitated in 50 cubic centimeters of raw water before treatment. After precipitation, decantation and filtering the hydrobimetric titre is taken. The same procedure is followed with the same quantity of water after treatment, and this water should exhibit a titre about 12% lower. This difference in hydrobimétrique titre arises from the acceleration of the precipitation occasioned by a rise in the electric field, causing an augmentation of the phenomena of repulsion of the electronic rampart of the atom, as explained above with reference to Figures 4 and 5.

When the vessel has contained for some hours water treated by means of the plant described above, it is necessary, if this apparatus is to be used again, to discharge the energy that it has accumulated. For this purpose, in the case of laboratory apparatus, the apparatus will be immersed in a bath of raw water in lost circuit for a period of a least 48 hours, in order to obtain the maximum dissipation of the energy accumulated by the glass or metal of which this apparatus is composed.

In a laboratory installation or in an industrial plant, notwithstanding all the precautions taken, the dissipation of energy to the ground is not always suitably affected.

The local influence of the earth's magnetic field may cause this coefficient of dissipation to vary, and at the end of a certain time it is noticed that the action of the process is ceasing.

There is an accumulation of energy upon the screen grid and upon the glass or metallic masses of the vessels. A couple is established which diminishes the electromotive force owing to an insufficient loss of energy. It is necessary at this stage to discontinue the treatment in order that the low potential of the untreated liquid may permit the energy accumulated by the masses of the vessel to restore this energy to the untreated liquid. This discontinuance of the treatment always lasts from 10 to 15 days, but the process

does not cease to act in consequence; it merely acts in the opposite direction.

In point of fact, the metallic masses restore their energy to the untreated liquid, and the dissociation phenomenon continues as during the emission of electrons.

Numerous modifications may be made in the plant that has been described above by way of example.

In particular, Figs. 6, 7 and 8 represent a water chamber or column 20 in which is mounted an installation according to the invention comprising an emitter 4, a grid 10 and connections 14, these connections 14 extending down into a well 21, and ensuring very effective earthing.

The raw water is drawn up from this well through a pipe 22 and is thus passed into a first purifier 23, and from there is passed through a pipe 24 into the water column, in which it undergoes the electrostatic treatment described above.

The emitters 4 may advantageously be arranged in the form of a letter V, as shown in Figure 7, the grids 10 being placed facing these rows of emitters.

The water thus treated is charged with electrons and conveyed through a pipe 25 to the piping that it is desired to treat.

Figure 8 illustrates the construction of the screen grid of large dimensions utilised in the plant shown in Figures 6 and 7. This screen grid consists of a frame 26, of wood or other material, about which is wound a copper wire 27, which is earthed at 13 through the connection 14, while the frame 26 as a whole is suspended by a wire 28 from insulators 29. In this way a screen grid of very large surface area is obtained, which consequently acts effectually in water chambers of very large dimensions.

Figures 9 and 10 also illustrate a water chamber or column 30 provided with an installation according to the invention. This installation comprises emitters 4 which are arranged between two screen grids 10<sub>1</sub> and 10<sub>2</sub> which are earthed at 13 through the conductor 14. The grid is in this case constructed in the manner indicated in Fig. 11, according to a principle which exactly agrees with that already described with reference to Figure 10, comprising therefore a wooden frame 26, a copper wire 27 wound on to this frame, a copper wire 14 for establishing an earth connection at 13, and a suspension wire 28, with insulator 29.

Finally, Figure 12 illustrated an installation comprising a round ended hot water tank provided with a device according to the invention. This plant included a tank 35, which receives cold water at 36, and distributes hot water at 37. The heating of the mass of water is effected by a nest of tubes 38 supplied with low pressure steam.

The emitter 4 and the grid 10 are arranged one on each side of the nest of tubes 38. This emitter is suspended from a cover 40 through the medium of an insulator 6. The grid 10 is connected through a nut 41 and a copper wire 14 to earth at 13. A pipe 42 connected to a drain cock 43 enables the residues decanted in the interior of the tank 35 to be discharged into a bucket 44.

The functioning of the plant as a whole represented in Figure 12 is just like that described with reference to the preceding schemes.

The electrostatic dissociation effects obtained by means of the apparatus according to the invention may be combined with chemical reaction

effects, the combination of these means accelerating the said chemical reactions.

Figure 13 illustrates an installation comprising this combination.

This installation includes a tank 50, in which are immersed eight emitters 4 and a screen grid, which may for example be similar to that shown in Figure 8 and described with reference to that Figure. The liquid, the potential of which has been raised under the action of the electrostatic energy brought into play, flows from the tank 50 through a pipe 51 into a purifier 52. This purifier receives from some other source a reagent such as sodium carbonate, supplied by a measuring device 53.

As explained above, the electrostatic energy accelerates the reaction and the precipitation of the separate products. The precipitates are discharged through a drain cock 54, which is earthed at 13. The liquid thus purified traverses in an upward direction a filter 55, and is poured out into decantation troughs 56<sub>1</sub>, 56<sub>2</sub> and so

forth, which are provided with drain cocks 57<sub>1</sub>, 57<sub>2</sub> and so forth.

The water thus purified is delivered by a pump 57 into a boiler 58. This water, still charged with electrostatic energy, gives up this energy little by little to the metallic walls of the boilers, which are carefully earthed at 13. In consequence of this the coatings adhering to the internal surface of the boiler are detached, converted into pulverulent mud, and discharged through drain cocks 59. In this way any excessive concentration of salts in the boiler is prevented.

The water leaving the boiler and still containing the caustic soda formed by hydrolysis in the boiler is passed through a pipe 60 into the purifier 52, in which it precipitates various products, particularly salts of magnesium, and therefore the excess carbon dioxide entrained by the soda is liberated in the purifier.

ANDRÉ JEAN BARBIER.



PUBLISHED

MAY 18, 1943.

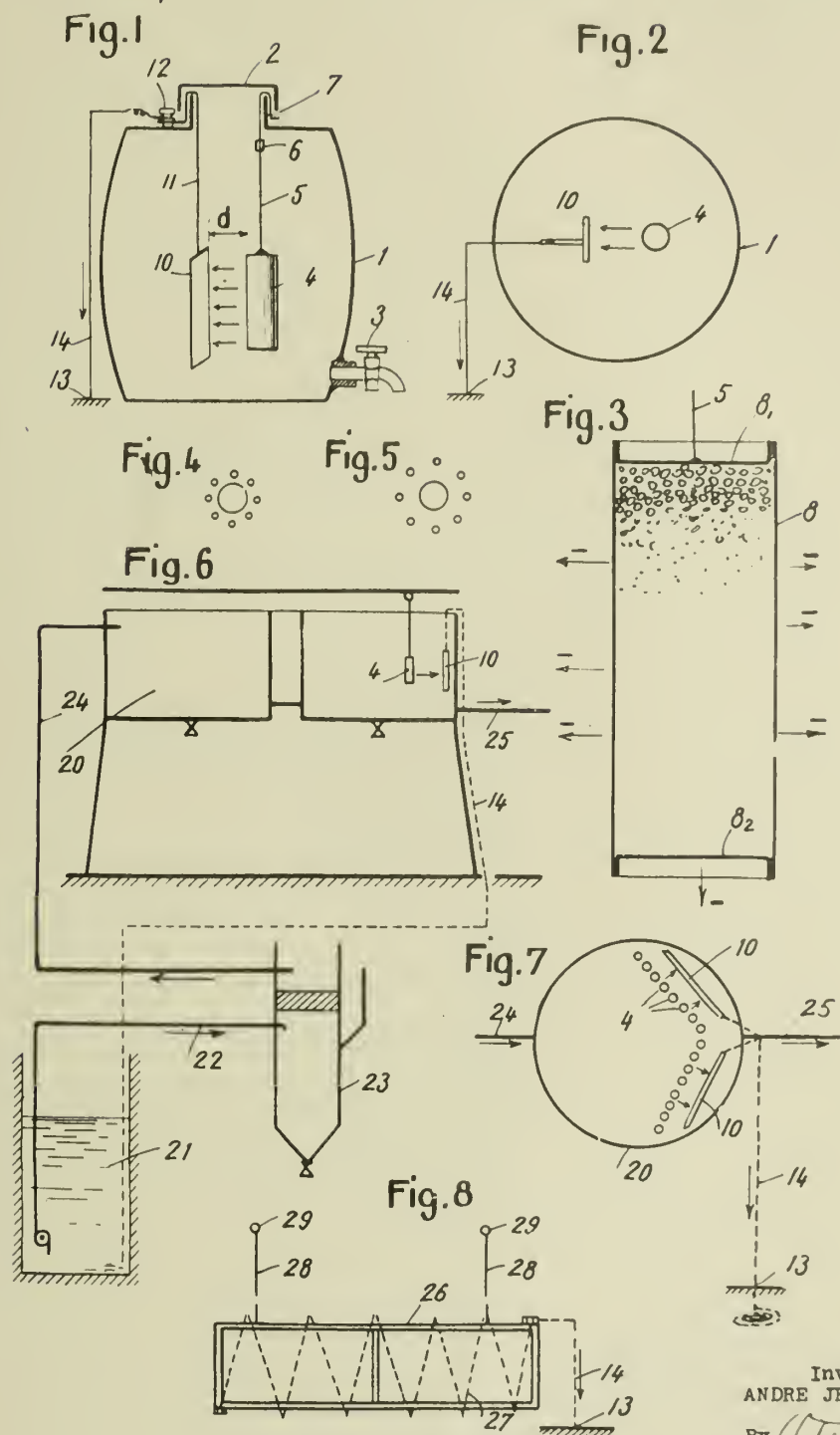
BY A. P. C.

A. J. BARBIER  
APPARATUS FOR THE ELECTRONIC  
TREATMENT OF LIQUIDS  
Filed June 15, 1940

Serial No.

340,856

4 Sheets-Sheet 1



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APPARATUS FOR THE ELECTRONIC  
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4 Sheets-Sheet 2

Fig. 9

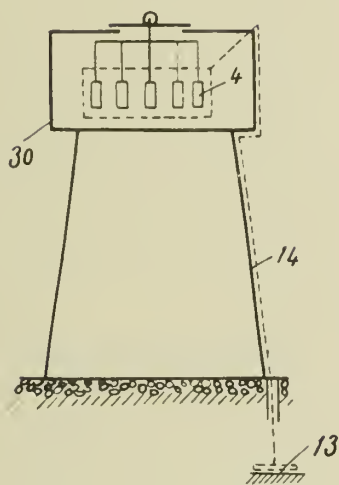


Fig. 10

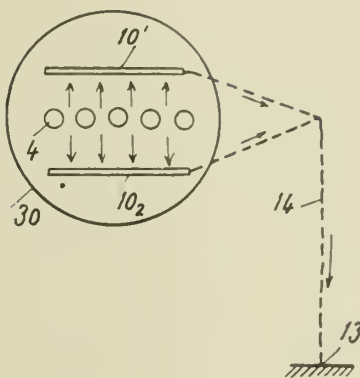
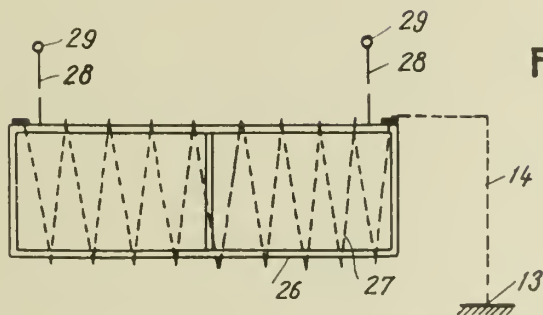


Fig. 11



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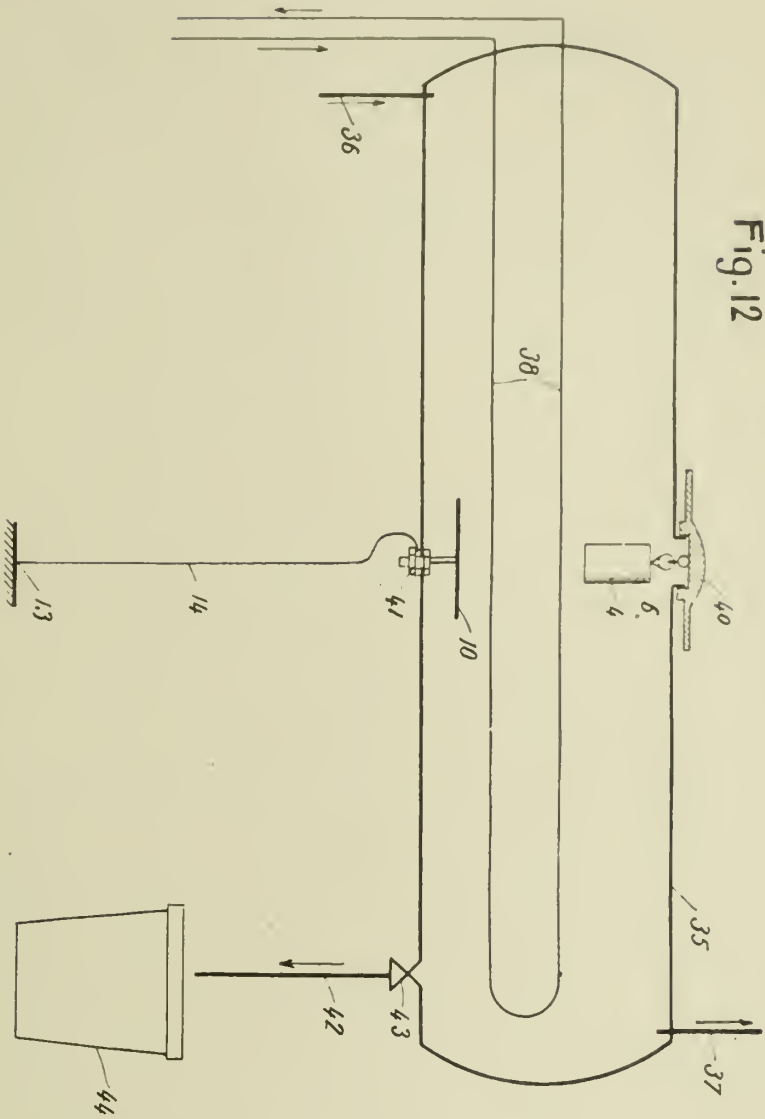


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4 Sheets-Sheet 3



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Serial No.  
340,856  
4 Sheets-Sheet 4

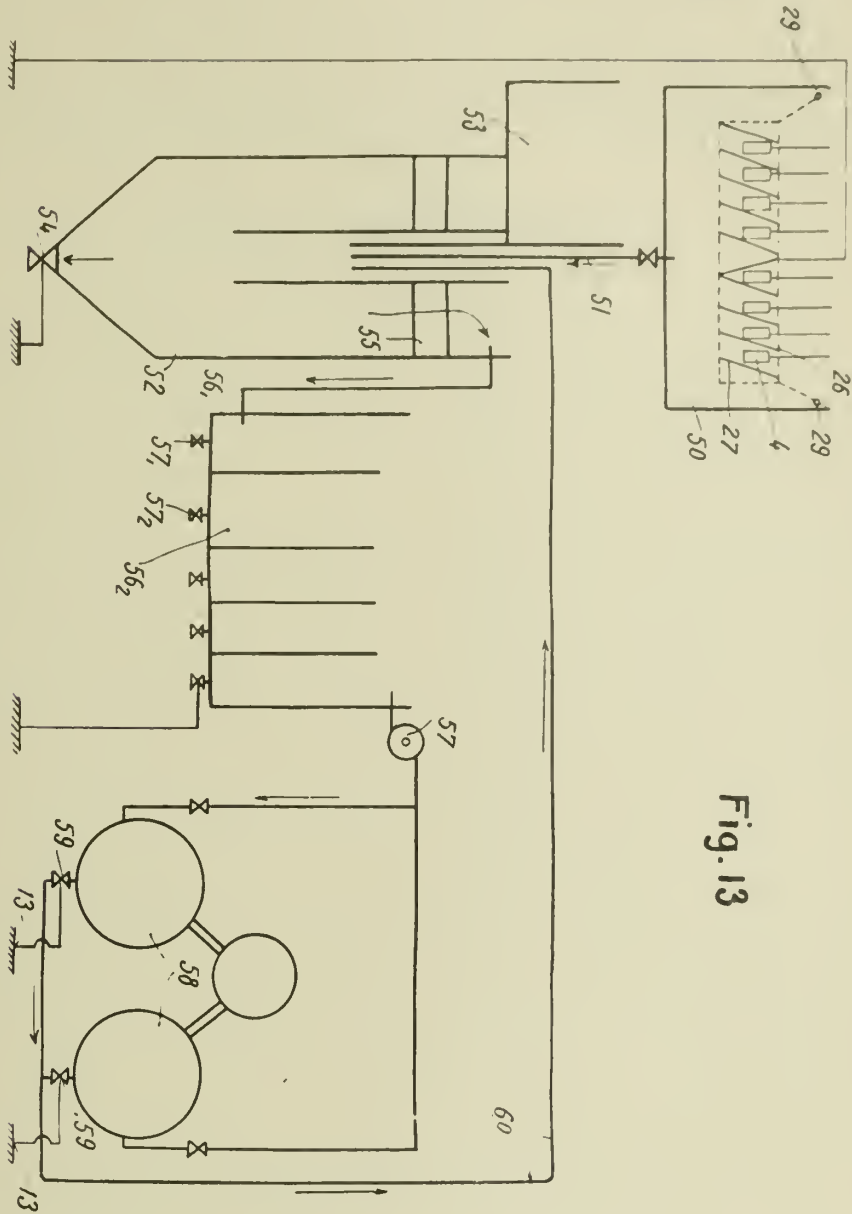


Fig. 13

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ALIEN PROPERTY CUSTODIAN

TRANSFORMER

Herbert Bähring, Klein Machnow, near Berlin,  
Germany; vested in the Alien Property Custodian

Application filed June 18, 1940

The invention relates to transformers used in connection with saw-tooth oscillators for the deflection of cathode rays, f. i. for television or oscillograph purposes. The invention relates particularly to transformers from which a high tension is derived as anode potential for the operation of the cathode ray tube.

It is an object of the invention to provide a transformer having two or more high tension windings of very low capacity connected to a similar number of rectifying tubes. A further object is to provide an arrangement of the windings in such a manner that points of equal A. C. potential are situated adjacent to one another. It is a further object to improve a transformer of this type having a window in the core thereof in which the windings are arranged.

According to the invention the windings are divided into a number of divisional coils and these divisional coils are so grouped that the sequential order of the divisional coils in adjacent groups is opposite with respect to their relation to the different windings.

Other aspects of my invention will be apparent or will be specifically pointed out in the description forming a part of this specification, but I do not limit myself to the embodiment of the invention herein described, as various forms may be adopted within the scope of the claims.

Referring to the drawing  
Fig. 1 shows a cross-section through the windings of a transformer,

Fig. 2 a circuit arrangement for this transformer,

Fig. 3 another circuit arrangement and

Fig. 4 a cross-section through the windings of a transformer used in connection with Fig. 3.

In Fig. 1 the ferro-magnetic core 1 of a transformer has longitudinal windows 2 in which the coils of the high tension windings 3, 4, 5 are arranged. According to the invention the high tension windings 3, 4 and 5 are divided each into four divisional coils 3a, 3b, 3c, 3d, 4a, 4b, 4c, 4d, 5a, 5b, 5c, 5d. The coils 3a, 4a, 5a and 3b, 4b, 5b, etc. form each a group 7, 8, 9 and 10. The arrangement of the divisional coils within the groups is effected in such a manner that the sequential order in adjacent groups is inversed according to the following scheme:

Group-----	7	8	9	10
Divisional coils--	3a, 4a, 5a	5b, 4b, 3b	3c, 4c, 5c	5d, 4d, 3d

Furthermore the divisional coils are arranged within each group in such a manner that points having the same A. C. potential are adjacent to one another. The direction of winding is the

same in all divisional coils. The coils have preferably the form of flat discs.

The arrangement of the invention has the following advantages: Within each individual group the potential between the divisional coils remains constant because points having equal A. C. potentials are adjacent to one another. The high dielectric constant of the insulating material has no detrimental effect with regard to the capacity because there exists no A. C. potential between the coils within each group. It is therefore possible to use for the insulation a material having a high dielectric constant so that the distances between the coils can be made very small. An alternating potential exists between adjacent groups so that in this case air is used as insulator. The capacity between the individual groups is therefore kept at a small value. The distance between the groups is made so that the capacity between the groups is kept at a reasonable value.

The arrangement of this type has the result that the total capacity of a transformer having  $n$  groups with  $p$  coils each is not larger than that of an air-insulated transformer having  $n$  disc coils while the high tension is  $p$  times higher than of an ordinary transformer with disc coils. At the same time the safety against electric breakdown is kept at a high value. An arrangement of this type makes it possible to use a large number of coils in each group and thereby to increase the high tension to a large degree without at the same time increasing the capacity of the transformer.

The circuit arrangement of Fig. 2 in which a transformer of the type described is used contains an oscillator tube 11. The grid circuit of this tube is supplied with impulses of the form indicated in the drawing. A saw-tooth current is produced in the anode winding 3 of the tube. The coil 3 is arranged on the transformer 1 together with the high tension windings 4 and 5. The high tension produced by the voltage peaks corresponding to the short retrace period of the saw-tooth oscillation are rectified in rectifying tubes 12, 13 and 14 and the D. C. voltage produced by the circuit arrangement of the rectifying tubes is taken off at the terminals 15 and 16. Condensors 17, 18 and 19 are arranged between the stages of the rectifying arrangement. The heating current for the rectifying tubes is derived from additional windings 20, 21, 22, arranged on the same transformer.

Fig. 3 shows a circuit diagram for an arrangement in which simultaneously deflecting currents

and the high tension for the cathode ray tube are produced. The oscillating tube 23 is connected to the anode coil 3 arranged together with a grid coil 24 and high tension windings 4, 5, 6 upon the transformer 1. The deflecting coils 27 are connected by way of condensers to the winding 24. The arrangement of the windings on the transformer is shown in Fig. 4. The heating current for the rectifying tubes is not taken off from divisional windings but directly from a part of the high tension windings. Only the last rectifying tube receives its heating current from a separate winding 26. The rectified voltage is taken off at the terminals 15 and 16. The condensers 17, 18, 19 of Fig. 2 are replaced by a single condenser 25. The high tension windings are divided in this case into six divisional coils. It is preferable in certain cases to divide the high tension windings into an even number of divisional coils. Fig. 4 shows that the grid coil 24 of the tube 23 is arranged in the centre of the six groups of coils. This has the advantage that the stray field between anode and grid windings is small, i. e., that the coupling is very close.

In order to save insulating material between the high tension windings and the core of the transformer it is preferable to apply a part of the high tension to the core of the transformer. In case all divisional coils are insulated from the core by air it is preferable to apply a voltage equal to approximately half the high potential to the core so that the insulation between the core and the coils has to withstand only half of

the high tension. If the divisional coils are insulated from the core by insulating material other than air the core may have a high tension differing from the above mentioned value. In the embodiment of Fig. 3, f. i. the divisional coils 5 and 6 are insulated against the core by an insulating material. In this case it is preferable to apply the rectified high tension directly to the core of the transformer. In order to save insulating material and winding space the divisional coils of winding 4 which is connected directly to the core of the transformer are arranged adjacent to the core. The distance between this winding and the core can be kept small because there is no DC voltage between the two. It is furthermore preferable to make the arrangement so that the coils of the anode winding of the tube 23 are arranged adjacent to the grid coil 24 because no high tension exists between these coils.

The transformer arrangement is not limited to the described embodiments. It can be used generally in connection with transformers for producing high potentials. It is particularly of advantage for high frequency transformers and particularly for the production of high voltages from saw-tooth currents in television apparatus. It makes no difference whether the transformer is arranged behind the amplifier tube or whether it is used directly as a part of the saw-tooth oscillator circuit.

HERBERT BÄHRING.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

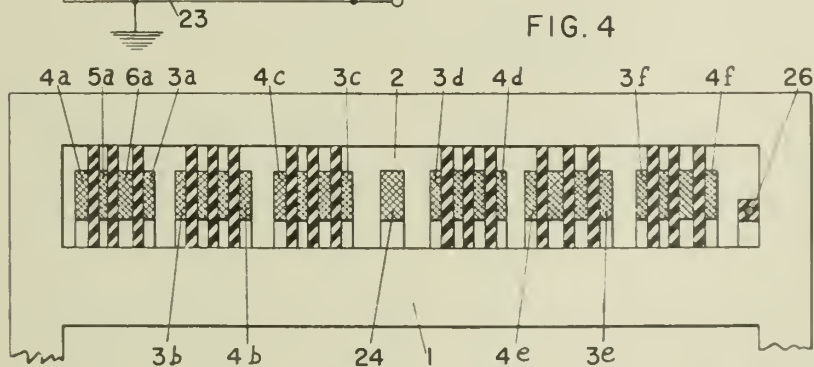
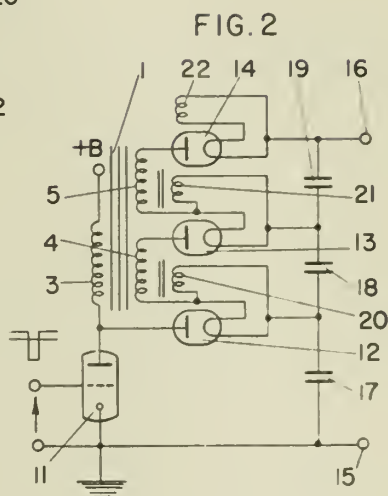
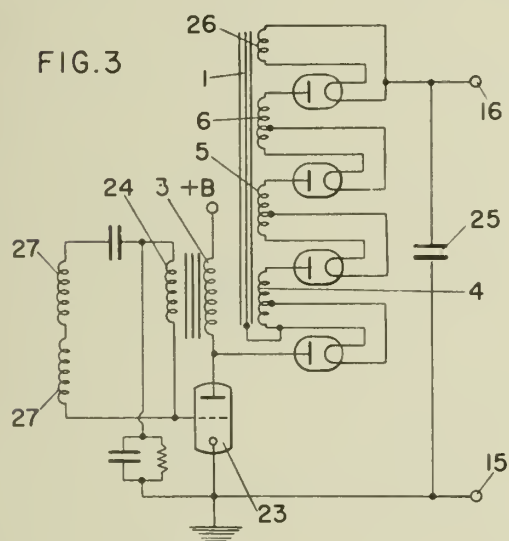
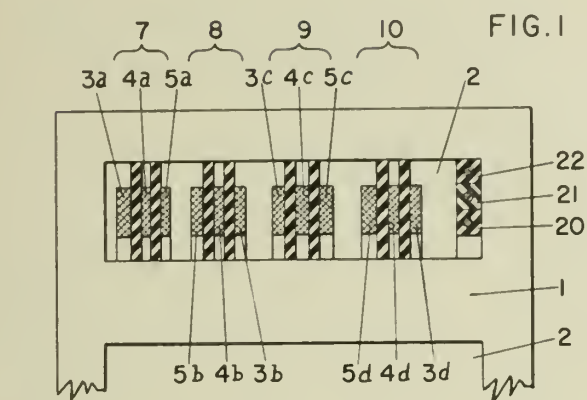
H. BÄHRING

TRANSFORMER

Filed June 18, 1940

Serial No.

341,170



INVENTOR  
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# ALIEN PROPERTY CUSTODIAN

## ARRANGEMENT OF WINDING FOR HIGH-FREQUENCY PURPOSES

Adolf Weis, Berlin NW 87, and Josef Brackmann,  
Berlin-Siemensstadt, Germany; vested in the  
Alien Property Custodian

Application filed June 21, 1940

This invention relates to an arrangement of winding for high-frequency purposes, the inductance of which is varied by means of a controllable direct-current magnetic bias. Such an arrangement is shown in Fig. 1 in diagrammatic form, in which 1 denotes the core for the exciter system, 2 the winding arranged thereon and supplied with direct current capable of being controlled. 3 denotes the iron core arranged between the poles of the exciter core and which consists preferably of compressed iron powder, said core being associated with the winding 4 whose inductance is to be controlled.

The invention is based upon the following considerations. Let  $\mu_a$  be the initial permeability of the material of the magnetizable core of the alternating-current winding,  $\mu_r$  the reversible permeability of the material for the corresponding induction  $B$  which produces in the material the constant magnetic field influencing the coil core and  $B_s$  is the saturation induction of the core. The ratio  $\mu_r:\mu_a$  may then be represented as a function of  $B:B_s$ . The value  $\mu_r:\mu_a=1$  corresponds on the curve of the graphically represented function according to Fig. 2 to the value  $B:B_s=0$  and the value  $\mu_r:\mu_a=1:\mu_a$  corresponds to the value  $B:B_s=1$ .  $\mu_r:\mu_a=1$  determines the greatest inductance value of the alternating-current winding and  $1:\mu_a$  the smallest inductance value that can be attained.

From the above considerations it follows that in order to utilize to the greatest extent the variation of inductance that can be attained, i. e., the greatest possible regulating range, the core of the exciter system must be made of such a material that its direct-current magnetization may bring about the saturation inductance of the magnetizable core of the alternating-current winding. Consequently, the magnetizable core of the exciter winding consists according to the invention of a material whose magnetic saturation inductance under consideration of the cross-section which the magnetizable core of the alternating-current winding offers to the flux of the constant magnetic field is at least equal to the magnetic saturation inductance of the material of this core. If on the other hand a material of the

smallest possible saturation inductance is employed according to the invention for the magnetizable core of the alternating-current winding it is then possible to completely control the regulating range of inductance on the basis of a relatively slight constant magnetic field inductance. However, this means that only a small magnetic power of the exciter system is required, i. e. a small electric direct-current source or a small magnetizing current or a simple exciting winding or a slight heating of the exciter system. If a material of the exciter system of the greatest possible permeability is employed according to the invention this effect of the complete utilization of the variation of inductance of the alternating-current winding in the case of a small magnetic power of the exciter system is supported to a considerable extent.

As a material of slight saturation for the core of the alternating-current winding a material of about 16000 Gauss or less is employed. In this case the magnetizable particles consist, for instance, of an iron-nickel alloy. This alloy may contain to advantage a certain amount of copper.

As materials within the scope of the invention for the exciter core with the greatest possible permeability of 20000 Gauss or more, pure iron gained from carbonyl iron or an alloy containing 50% iron and 50% nickel and having a special rolling texture have proved suitable.

It is thus possible according to the invention to reduce the necessary magnetic power of an arrangement of winding of the above-indicated character for varying the inductance between  $L_{max}=0.079 \text{ mH}$  and  $L_{min}=0.199 \text{ mH}$ , i. e., according to the ratio of 5:1 to 1.2 watts as compared to a magnetic power of 9 watts previously necessary for the system in order to vary the inductance between  $L_{max}=1.09 \text{ mH}$  and  $L_{min}=0.33 \text{ mH}$ , i. e., according to the ratio of 3:1.

Consequently, by the use of the invention a wide controlling range of the winding whose inductance is to be varied may be attained by an exciter system of a small magnetic power.

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JOSEF BRACKMANN.



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MAY 18, 1943.  
BY A. P. C.

A. WEIS ET AL  
ARRANGEMENT OF WINDING FOR  
HIGH-FREQUENCY PURPOSES  
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341,722

Fig 1

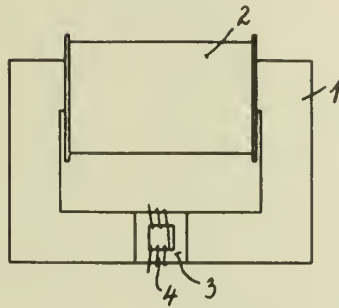
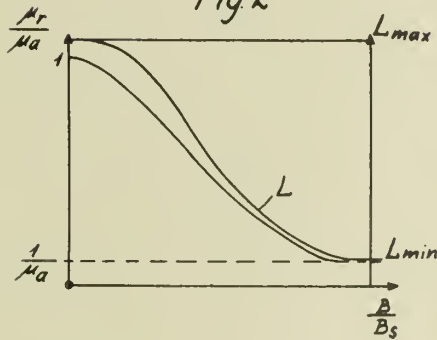


Fig 2



Inventors:  
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attys  
416



# ALIEN PROPERTY CUSTODIAN

## FOLDING TRUNKS AND THE LIKE

Jean Hamon, Neuilly-sur-Seine, France; vested  
in the Alien Property Custodian

Application filed June 26, 1940

It is well known, that stiff or supple trunks and the like have the great inconvenience of being cumbersome when not in service.

The object of the present invention is to obviate this drawback by a proper folding device acting on one, at least of the sides so as to render the trunk or the like as small as possible, and to obtain at the same time the smallest possible weight.

The peculiarity of this invention resides in the feature that the sides or gussets which are perpendicular to the bottom and the top, and are made of a soft material, are combined with a folding frame enabling the said sides to be either stiff or to be folded, according to whether the trunk is to be used or not.

The invention will be more clearly understood from the following description which refers to the drawings appended showing, merely in the way of an example which is in no way exclusive, a simple and quick working embodiment permitting an easy construction securing the purpose aimed at.

On the drawings:

Fig. 1 shows a trunk unfolded and opened, and

Fig. 2 the same folded together, its lid being partly torn away.

In this type of execution, the trunk, small trunk, hat box, and so on is preferably composed of two frames 1 and 2 connected to each other by branches 3, held in their opened or closed position by means of springs.

The frames 1 and 2, either of wood or metal, can consist of rods of round, square, rectangular, or any other convenient section.

It is obvious that the frames 1 and 2 connected by the branches 3 form a parallelopipedal folding frame, the height of which can be immediately reduced to the thickness of the frames and the outer covering attached to them.

These coverings 4 and 5 can be made either of a stiff material (wood, card board, light metal, and so on), or of a soft material (canvas, leather, skin, and so on). They may be fitted with an inside lining or garniture.

The lateral sides 6 are made of a soft material (canvas, leather, skin, and so on) lined so as to hide the branches 3.

The bottom 5 is attached to the sides 6, and the lid 4 is arranged to allow opening or closing. This lid may be closed by any appropriate system of hooks or locks or by a quick fastener.

A handle 8 conveniently fixed according to the shape of the trunk completes the device.

It is obvious that this shape may infinitely vary and that the invention can be adapted to luggage and packages of any size.

The system of fixtures 3 can be replaced by any other articulated system working on the same lines (crossed bars with trolleyed extremities, folding parallelograms fitted with springs or appropriate bolts to ensure stiffness in both positions of use and of rest).

Straps or any other means can be adapted to the trunk or the like in order to vary the depth in order to use half only of its normal depth without altering the idea of the invention.

JEAN HAMON.



PUBLISHED

MAY 18, 1943.

BY A. P. C.

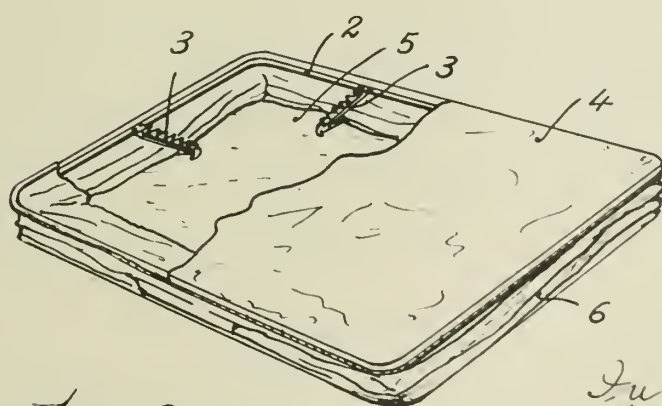
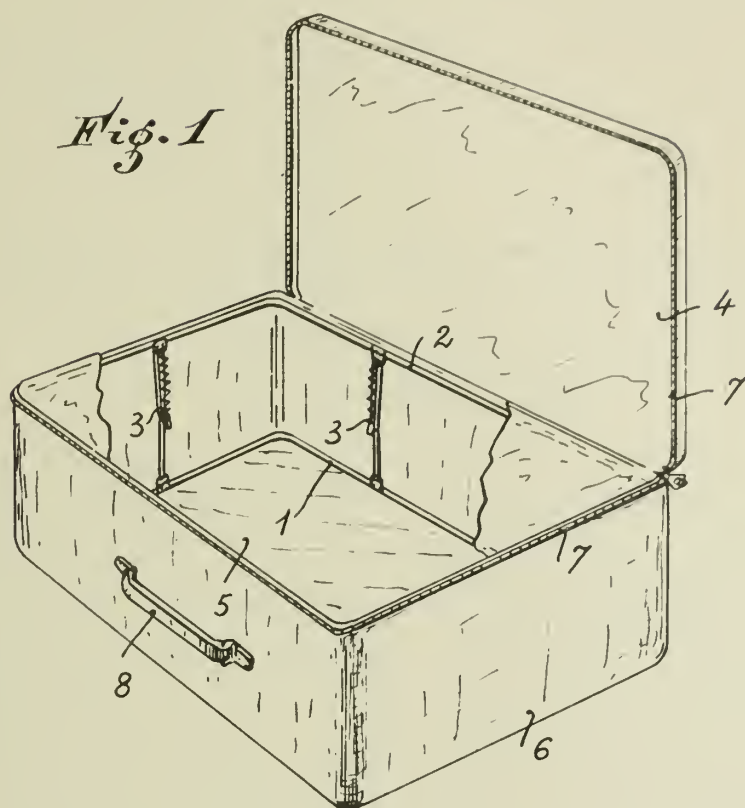
J. HAMON

FOLDING TRUNKS AND THE LIKE

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342,563



*Fig. 2*

Inventor  
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# ALIEN PROPERTY CUSTODIAN

## DUST-CORE ARRANGEMENT

Helmut Feussner, Berlin, Germany; vested in  
the Alien Property Custodian

Application filed June 27, 1940

It is known that oscillation circuits of the kind used in radio signalling work may be tuned by varying the inductance or part of the inductance of the oscillation circuit by altering the permeability of a ferro-magnetic core of the coil. In order to minimize the radio frequency losses recourse is had to what is known as dust-cores, the variation of tuning being then effected in such a way by placing the coil with the dust-core between the pole-shoes of a magnet and by regulating the magnetic flux through the pole-shoes and the dust-core certain amounts.

Fig. 1 of the appended drawing shows an oscillation circuit comprising the parallel arrangement of condenser C and coil L in which the inductance L is made variable by disposing a coil with a dust-core *m* in parallel relation to a number of turns.

Now, the aim and object of the present invention is to make the conditions for the dust-core as favorable as feasible. According to the invention the dust-core is shaped as flat as feasible in order that the distance of the pole-shoes of the magnet between which it is placed can be reduced to a relatively small value with a view to thus cutting down the reluctance of the circuit. However, in order that, on the other hand, the radio frequency magnetic field may cut across the coil surround-

ing the dust-core in a satisfactory and thorough manner, the turns of the coil are arranged inside the dust-core, that is to say, they are placed zigzag-fashion in bore holes or ducts as shown in Fig. 2. These holes, as will be seen from the drawing, are placed adjacent to one another inside one plane and in positions so as to be parallel to the broad side or base of the dust-core.

Fig. 3 shows the arrangement of the dust-core between the pole-shoes M and M'.

The magnetic lines of force which leave the dust-core cause losses in the pole-shoes. In order that these losses may be minimized it is expedient to place a layer consisting of highly conducting material, most preferably copper, between the pole-shoes and the dust-core, the said layer acting like a short-circuit path or winding setting up counter-acting fields so that the pole-shoes made of ferro-magnetic material are thus shielded from the high-frequency fields. The said highly-conducting intermediate layer may be disposed in various ways. For instance, the surface of the dust-core could be copper clad or plated. However, it is also possible to place a layer of copper, for instance, upon the pole-shoes as indicated in Fig. 3 by the shaded portions or areas K.

HELMUT FEUSSNER.

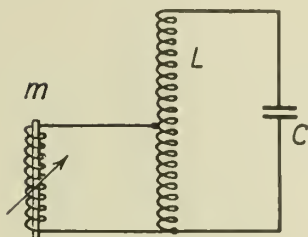


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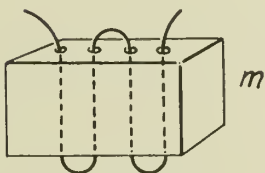
H. FEUSSNER  
DUST-CORE ARRANGEMENT  
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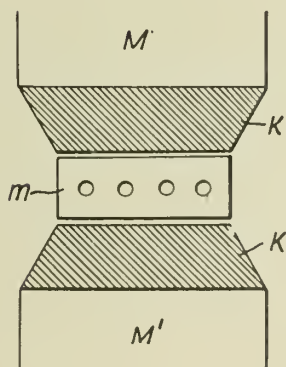
*Fig. 1*



*Fig. 2*



*Fig. 3*



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ATTORNEY



# ALIEN PROPERTY CUSTODIAN

## ROTARY CONDENSER OF REDUCED SIZE AND HIGH CAPACITY

Günter Karpa, Berlin, Germany; vested in the  
Alien Property Custodian

Application filed June 27, 1940

This invention is concerned with a rotary condenser which combines small dimensions with high capacity. Condensers of this kind are often required in apparatus in which space economy and weight is of great importance, say, on board airplanes.

The size of a rotary condenser, if dimensions are to be minimized as much as possible, is a function of the interplate distance and the dielectric. It is hardly possible, for mechanical reasons causing the plates to short-circuit, to make the spacing less than .2 mm. Hence, to obtain high capacity values, a dielectric of a high dielectric constant must be employed. Inasmuch as gases possess too low a dielectric constant, while solid material would impede the motion or mobility of the rotor plates, it is practically only a liquid that may be used for the dielectric material. Water which because of its high dielectric constant might appear most appropriate, is attended with practical difficulties where used because its freezing point lies at 0 degrees C.

However, useful results are obtained, according to the invention, with a mixture comprising water and alcohol, a mixture of about 45 percent alcohol and about 55 percent water having proved most satisfactory. This mixture has a freezing point of around -50 degrees C and a dielectric constant of around 60. One drawback of this mixture, however, is that its dielectric constant is altered .3 per degree C upon temperature fluctuations. Thus, according to another object of the invention, the condenser is confined inside a pref-

erably tubular thermostat or approximately constant temperature casing.

The drawing shows an exemplified embodiment of the object of this invention. The condenser C is located within a Dewar vessel G having, for instance, the form of a thermos bottle conveniently of tubular shape being provided both inside and outside with a reflecting (metallized) surface. Between the walls of the jacketed glass envelope of vessel G is a vacuum less than .2mm Hg pressure. An experiment has shown that when using a simple thermos bottle with an open neck and a temperature difference of 40 degrees outside referred to the inside, the capacity of such a condenser would rise, inside one hour, about .2 cm and this means a drop of temperature of around .5 degree. By better evacuation, still more favorable results are obtainable. The metallic base S is made of a material having a low thermal conductivity and is connected to fixed plates ST. The terminal pins set into the base as indicated by K insure rapid replacement of the condenser. The rotor of the condenser is denoted by R and the stator by St. while W designates the shaft turning the rotor. The plates are preferably semi-circular in shape. If desired, packing material of low thermal conductivity may be provided between the base S and the shaft W to prevent the liquid dielectric from leaking out. Connection is made to the rotor plates by any suitable means, such as a brush (not shown) contacting shaft W, or a flexible connection from rotor plates R to metal pin K which is insulated from base S.

GÜNTER KARPA.



PUBLISHED

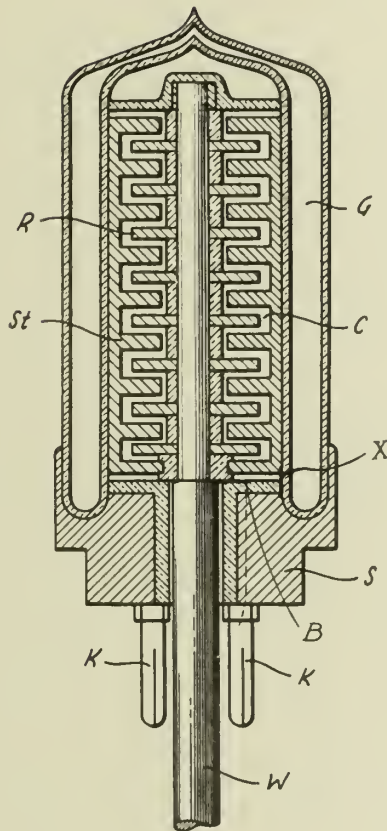
MAY 18, 1943.

BY A. P. C.

G. KARPA  
ROTARY CONDENSER OF REDUCED  
SIZE AND HIGH CAPACITY  
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342,668



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# ALIEN PROPERTY CUSTODIAN

## ELECTRIC FIELD SHIELDING MEANS

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in the Alien Property Custodian

Application filed June 29, 1940

Electrical fields according to prior practice have invariably been shielded by means of electrically conducting parts. Such electrically conducting parts act as short-circuit paths for the field. In fact, shielding means of this nature, if suitably designed, even where high frequencies are dealt with, exhibit no appreciable voltage differences so that the shielding surfaces may be regarded as equi-potential surfaces. The electrical field lines are almost at right angles to the surfaces of the electrically conducting shielding means.

The use of ferro-magnetic shielding means as practiced in the case of magnetic fields corresponds to the shielding of electrical fields as hereinbefore outlined. Also these ferro-magnetic shielding means form short-circuiting paths for the fields to be shielded against.

However, while such ferro-magnetic shielding means against magnetic fields have been used only occasionally, it has been almost exclusive practice to use electrically conducting shielding to screen off magnetic fields, particularly so where high frequencies are involved. These shielding means operate as follows: A small part of the field to be shielded sets up mmf's in the shield, and these in turn result in eddy currents which cause opposite fields so that only a small part of the field to be shielded will succeed in reaching as far as the shielding means. According to the invention the customary shielding against magnetic fields is applied to electrical fields by screening the electrical fields by means of structures having very high initial permeabilities. The action of such a shielding arrangement is as follows: A small part of the electric field to be screened reaches the shielding means and penetrates the same or at least a thin layer thereof. The electrical alternating field, that is, a small part thereof is in linked relation with the shielding means. As a result, a magnetic eddy field is set up in the latter. This eddy field results in an electric opposite field, and it is the latter which is responsible for the fact that only a small portion of the field to be screened off reaches the shielding means.

If for the shielding means ferro-magnetic materials possessing a high initial permeability are used of a nature inhering high electric conducting powers—and this is usually the case—then it will be expedient to so fashion and shape the shielding means that in their contour they fairly follow the original equi-potential surfaces of the electrical field to be shielded and as far as feasible do not follow along the lines of the elec-

trical field. In such a case a favorable and preferred form of construction is to arrange thin layers or sheets of the ferro-magnetic material in multiple one behind the other, the spaces between the various layers or sheets to be large in comparison with the thickness of the layers, while the spaces are to be filled with material having as high as possible a resistivity combined with a low dielectric constant. Such a shield, for instance, could serve the purpose of minimizing the capacitance between two conducting parts. For the same purpose the surfaces of conducting parts could be lined with ferro-magnetic coats.

If it is necessary to dispose shielding means of a nature as here disclosed also in the direction of the original plot or pattern of the electrical field lines, or obliquely thereto, then the ferro-magnetic layers or sheets must be split, while between the ferro-magnetic parts the reluctances should be as low as possible but the dielectric resistances for the electric field as high as feasible and as high as possible for the electric flux. These requirements which are contradictory or conflict insofar as the magnetic field and the electrical field are concerned must be compromised to suit the frequency band which may be involved.

A number of exemplified embodiments of the basic idea of the invention are illustrated in the appended drawing. Fig. 1 shows a cross-section of an airplane fuselage R which has a shield S consisting of ferro-magnetic material according to the invention which is active in respect to the electrical field. Placed upon the shielding is the sheet antenna the effective height of which is here roughly given by the distance between the antenna and the supporting surfaces or wings T of the airplane rather than by the small distance between the antenna and the upper part of the airplane fuselage. An antenna of this nature combined with the shielding means here disclosed will be found advantageous for power craft of all kinds.

Another exemplified embodiment is shown in Fig. 2. This shows a cross-section through an iron core which by means of shields S according to the invention is divided into several parts for the capacitive eddy currents. The said iron core may consist, for instance, of a mixture of iron dust and insulation material of a fictile or a moldable nature, in other words of a material possessing a comparatively low permeability. The shielding means consist of very thin layers

of material having a particularly high initial permeability.

The exemplified embodiment shown in Fig. 2 may be usefully employed in all cases where a ferro-magnetic core is cut by magnetic RF fields 5 as is true, for instance, of iron-cored coils.

Fig. 3 shows a line or conductor L shielded by the envelope M in which a ferro-magnetic shield is used to the end of minimizing the capacity. In order that the ferro-magnetic shield may not 10 cause any appreciable increase in inductance of

the conductor, it is built up of a plurality of very tenuous bands B each of which is wrapped so that there result large spaces, shielding being provided also for the said spaces by overlapping 5 of the bands.

Fig. 4 shows a condenser in which a homogeneous electrical field is insured by shielding means as here disclosed. Shielding S prevents leakage normally arising on the edges of the condenser 10 plates P from being set up.

FRITZ BERGTOLD.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

F. BERGTOLD

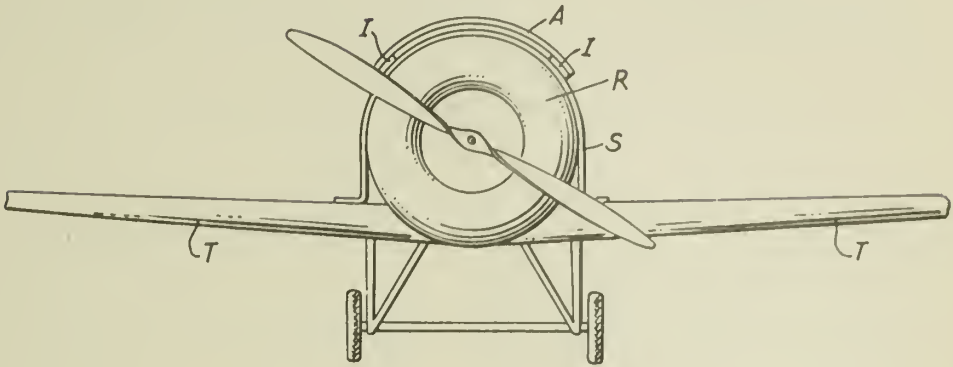
ELECTRIC FIELD SHIELDING MEANS

Filed June 29, 1940

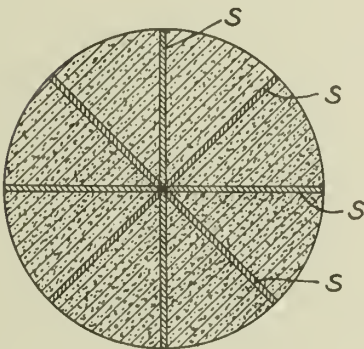
Serial No.

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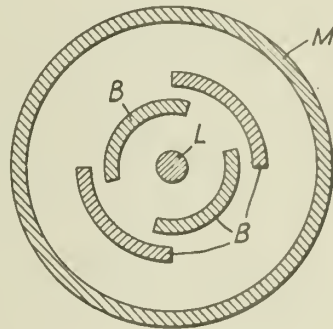
*Fig. 1*



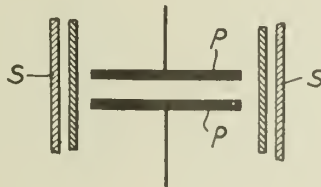
*Fig. 2*



*Fig. 3*



*Fig. 4*



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BY *H. S. Snover*  
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# ALIEN PROPERTY CUSTODIAN

## MULTI-ARMATURE IGNITION MAGNETO

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Alien Property Custodian

Application filed June 29, 1940

It is known to construct ignition magnetos provided with a field magnet system which acts on two independent armatures located on either side of the axis of the field magnet.

The general purpose of the present invention is to improve this type of magnetos and it is remarkable by several improvements which are capable of being applied thereto together or separately.

The objects it is desired to attain by means of these various improvements are in particular a simplification of the construction and an increase in the reliability of the mechanical system and of the control of the timing.

One of these improvements consists in the fact that in a magneto provided with a plurality of armatures which are influenced by the same rotary field magnet, the various distributors respectively associated with the various armatures each have their axis extending transversely to the axis of the field magnet and located or not in the same plane as the latter. This arrangement has in particular the result of enabling a very compact grouping to be obtained. Preferably, the axes of the distributors intersect at the same point on the axis of the field magnet, thereby enabling the drive of the various distributors to be effected by means of simple and strong bevel gears.

In the particular case of two distributors, an advantageous embodiment consists in arranging both the distributors along the same axis which is preferably perpendicular to and in the same plane as that of the field magnet, said distributors being arranged on either side of the axis of the field magnet and the rotary arms being carried by the same shaft which is driven by the shaft of the field magnet by means of a single pair of pinions. The mechanism for driving the distributors is thus very simple and very strong, but the two distributors rotate in opposite directions to each other.

If, for reasons of interchangeability, it is desirable to have both the distributors rotating in the same direction, the foregoing arrangement is modified by replacing the single shaft carrying the two rotary arms by two separate shafts, on each of which is fixed a gear wheel meshing with a common pinion fixed in the shaft of the field magnet and on either side of which these two wheels are arranged.

Another of said improvements, is that, if it is desired that the direction of rotation of the distributors should not change, whatever be that of the field magnet, the shafts of the distribu-

tors of the foregoing arrangement are terminated a sufficient distance from each other to allow a shaft forming the extension of the field magnet shaft to pass between their facing ends, it thus being possible for the pinion which is fixed on the said field magnet shaft to be mounted on either side of the shafts of the distributors.

Another improvement is that the angular setting of the armatures relatively to each other is different from the angular setting of the various pole pieces of the field magnet relatively to each other and also from any multiple of the latter setting.

Spark trains are thus obtained which are not simultaneous but are displaced in time from one armature to the other.

By way of examples which are in no way limitative, various embodiments of magnetos with two armatures, provided with the above improvements and furthermore having various peculiarities which form as many detail objects of the invention, have been shown in the accompanying drawing.

In said drawing:

Fig. 1 is a section of the whole of a magneto through a plane passing through the axis of the field magnet and the axis of the two distributors;

Fig. 2 is a similar view to Fig. 1 of a modification of construction;

Fig. 3 is a view of a modification of a detail of the magneto shown in Fig. 2; and

Fig. 4 is a diagrammatical section of another modification of a magneto, in which only the field magnet and the armatures have been shown.

In the embodiment shown in Fig. 1, the magneto comprises a rotary field magnet 1 which influences two armatures which are represented diagrammatically by the coils 2 and 3 and a fragment 4, 5 of the corresponding magnetic circuit. Embodiments of similar systems are well known from the electric and magnetic standpoint and it is not necessary to describe them herein. Each of said coils 2, 3 has its axis perpendicular to that of the field magnet and both coils are arranged quite near the field magnet, symmetrically with respect to a plane passing through the axis of the latter. At the end of the shaft 6 of the field magnet is fixed a bevel pinion 7 meshing with another bevel pinion 8 fast on a shaft 9, the axis of which is in the same plane as that of the field magnet and is perpendicular thereto. Said shaft 9 extends on either side of the axis of the field magnet and carries at each end an ignition cam 10, 11 and a rotary arm 12, 13. Said

arms respectively co-operate with fixed distributing bodies 14 and 15, to the centre of which the secondary current is conveyed by a conductor 16, 17 which is embedded in the insulating material of said body and is in contact at one end with a resilient fastener 18, 19 fixed on the corresponding coil.

This group of members is arranged in a metal case which surrounds all of them and the inside of which is divided into a plurality of compartments. Said case comprises a compartment 20, 21 surrounding the field magnet 1 whereof the shaft is carried by two ball bearings which are respectively fixed on two opposite walls of the compartment, the one of said walls through which the driving shaft end of the distribution shaft passes being formed by a removable cover forming part of a compartment 21 which is, as a whole, a surface of revolution about the shaft 9 carrying all the distribution members. This compartment 21 is provided axially with two openings in which are fitted the ends 22 carrying on the inside thereof the bearings of the distribution shaft and on the outside the whole breaker system. In this case, the compartment 21 has, relatively to said ends 22, edges which form a centering for the fixed bodies of the distributors. Furthermore, covers 25 and 26 which rest respectively on continuous flanges carried by the compartments 20, 21 each cover one of the coils and the fixed body of the corresponding distributor. Moreover, a fluid-tight compartment, not shown, only allowing the fixed part of the magnetic circuit which issues from the compartment 22 to pass, separates the inside of said compartment from the one in which are located the coil and the fixed body of the distributor. In the modification of construction of Fig. 2, the arrangement as a whole is substantially the same as that shown in Fig. 1, but the two cam and rotary arm sets are respectively carried by separate shafts 36, 37 which are located in the extension of each other and on which are respectively fixed bevel pinions 38, 39 meshing with the same pinion 7a fixed on the shaft of the field magnet 1. The rotary arms thus both rotate in the same direction for observers looking at the opposite ends of the shafts 36, 37: the fixed distribution bodies may therefore be identical, which is not the case in the embodiment shown in Fig. 1. In this example, the two coils 2a and 3a are no longer symmetrical relatively to a plane passing through the axis of the field magnet, but are located at different distances from the distribution shaft. In order that the electric connection members which are integral with the coils and with the fixed distribution bodies shall nevertheless be the same for both the armatures, there is interposed an intermediate connection 40 between the remotest coil 3a and the corresponding conductor 17; this connection is in this case formed by a conductor carried by a support fixed on the case of the field

magnet. It would also be possible to attach said support on the actual body of the distributor.

If it is desired to enable the field magnet to rotate indifferently in either direction, the arrangement of Fig. 2 is modified as shown in Fig. 3, that is to say that the shaft of the field magnet is extended beyond the axis of the shafts of the distributors, between the facing ends of which a sufficient passageway is left for this purpose and a keyway or other means is provided at two places on said field magnet shaft to enable the pinion 7a to be fixed on either side of the axis of the distributors. Preferably, as shown, the field magnet shaft is in this case supported at the end by a ball bearing 41 fixed to the case.

Of course, the particular arrangement of the coils and of their connections is independent of the manner in which the transmission is effected between the field magnet and the distributors; thus, for example, the arrangement of the coils shown in Fig. 2 may be used in a magneto provided with the transmission such as that shown in Fig. 1 and the transmission shown in Fig. 2 may be used in a magneto with coils arranged as in Fig. 1. It is also possible to construct in a similar manner a magneto with three armatures and three distributors, the axes of the latter being in that case preferably arranged  $120^\circ$  from each other, or even a magneto with  $n$  armatures and  $n$  distributors, the distributors in this case preferably forming groups, in each of which the axes of the distributors converge to the same point of the axis of the field magnet.

Fig. 4 shows an embodiment of an improvement which is independent of the improvements described above and which can be applied to any magneto with a plurality of armatures whatever be the general arrangement of said magneto. In the present example, said improvement has been applied to a magneto provided with two armatures which cooperate with the same field magnet and are arranged substantially  $180^\circ$  from each other about said field magnet. Instead of the poles 50 and 51 of each armature being exactly and respectively  $180^\circ$  from the poles 50 and 51 of the other armature whereas the poles of the same sign of the field magnet are angularly spaced just  $180^\circ$  apart, the angular displacement between the armature poles 50 or 51 is  $180^\circ - 2n$ . The spark trains thus produced by these two armatures are therefore not simultaneous, but displaced in time proportionally to  $2n$ .

In order that, in spite of this displacement, the body of the armatures shall remain  $180^\circ$  apart and the cutting of the plates forming the armature shall be the same for the plates of both the armatures, said plates are cut out with pole pieces which are displaced relatively to the axis of the armature half the required displacement  $2n$  and the plates are reversed in the frame so that the displacement of the pole pieces actually becomes equal to the required displacement  $2n$ .

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PUBLISHED

MAY 18, 1943.

BY A. P. C.

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MULTI-ARMATURE IGNITION MAGNETO

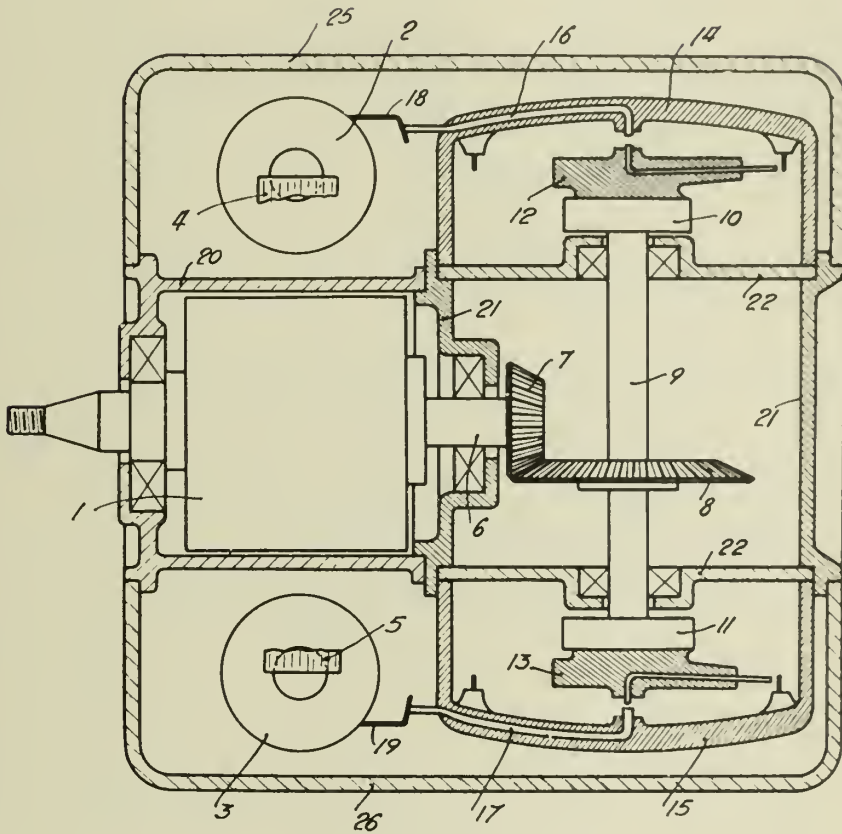
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3 Sheets-Sheet 1

Fig. 1



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Fig. 2

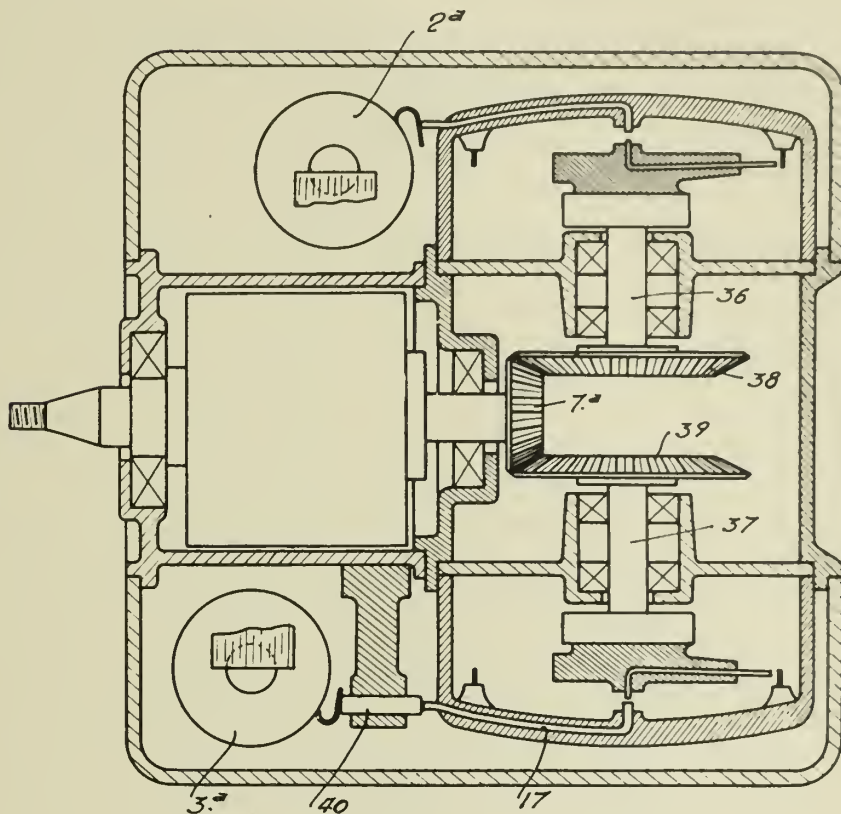
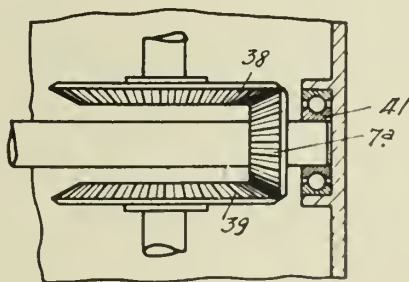


Fig. 3



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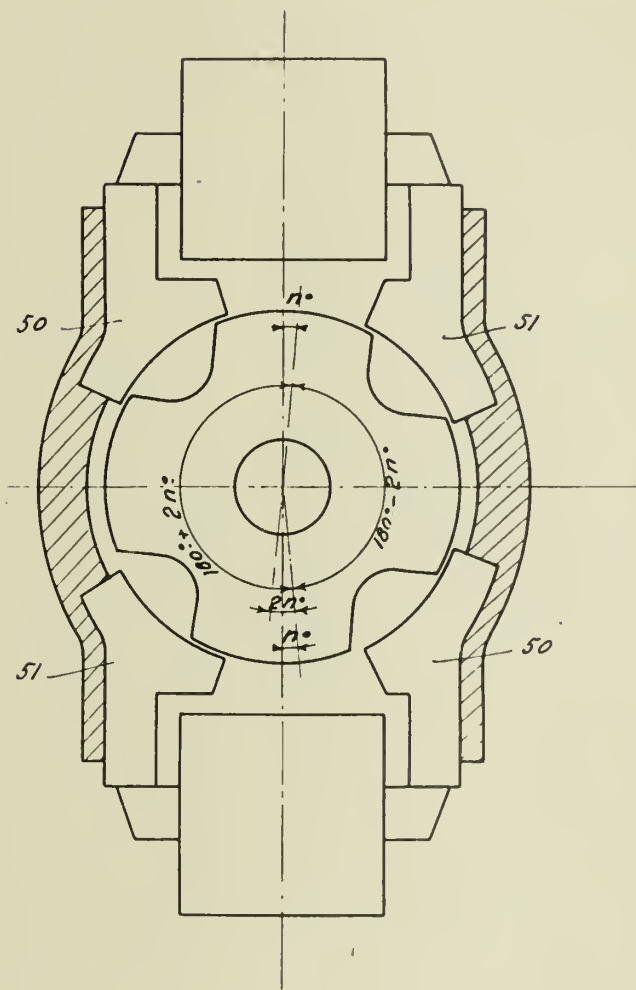


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Fig. 4



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# ALIEN PROPERTY CUSTODIAN

## METHOD AND APPARATUS FOR THE DEMAGNETIZING OF SMALL STEEL BODIES

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Application filed July 8, 1940

The invention relates to a method and apparatus for the demagnetizing of small steel bodies by means of a magnetic alternating field. The method is destined chiefly for the demagnetization of smaller steel bodies and small steel sleeves which are obtained in very large numbers in the manufacturing process and which are continuously demagnetized by a rapid method. Tests by means of a ballistic galvanometer showed that no remanent magnetism could be found in the demagnetized specimens.

The demagnetizing of iron bodies and steel bodies is systematically effected either by means of direct current or by means of alternating current, the employment of a switch for reversing polarity being characteristic for the direct current demagnetizing method, said switch being generally actuated by a mechanical drive. In order to obtain sufficient magnetization on steel bodies of larger cross-section, a smallest possible proportion of number of pole changing to time must be selected owing to the magnetic flux displacement towards the edge ranges. The induction impulses occurring at the opening of switches for reversing polarity and which might easily lead to destructions of the magnetizing windings are attenuated by special coil arrangements with utilization of magnetic blowing effect. For the demagnetization of electromagnetic setting up devices, for instance in grinding machines, the said proceedings are considered as sufficient. If, however, a most extensive removal of the remainder of magnetism is intended, the demagnetization must be started at a magnetic field intensity, which corresponds to the maximum existing intensity of magnetizing field. The magnetic field is then to be reduced as continuously as possible down to the field intensity zero, a low frequency of pole changing being desirable, especially for large cross-sections. The decrease of field intensity is effected by means of mechanically actuated rheostats. In the alternating current demagnetizing methods which have become known up to the present the demagnetizing effect is produced by rotating contacts, which are coupled in suitable phase position with the alternating potential and cyclically effect a reduction of the alternating amplitude, so that in the alternating current method the amplitude zero is also attained. For attaining this aim a special mechanical auxiliary arrangement is required.

For a continuous demagnetization of smaller steel bodies, especially for obtaining large numbers of pieces, the known methods have proved to be unsuitable, as their function requires too much time. This inconvenience is avoided in the method for the demagnetizing of small steel bodies with the aid of a magnetic alternating field in that, according to the invention, the steel bodies are moved through a coil through which alternating current flows, said coil having a step-like arranged winding with varying field intensity. The alteration of the field intensity of the step winding practically takes place step-free. The method according to the invention enables further a serious simplification of the building-up of the measuring arrangement.

The demagnetization by alternating current takes place in a coil  $l$ , in which the winding is carried out in a special manner. The number of layers of the winding changes stepwise in longitudinal direction of the coil body, as shown in Fig. 1 of the accompanying drawing. A continuous decreasing of the magnetic field intensity is obtained in the course of the coil by the decreasing number of layers, as soon as the body 2 to be examined is moved through the coil in the same direction. Fig. 2 shows the course of intensity of the magnetic field measured under these suppositions,  $H$  indicating the magnetic field intensity and  $l$  the length of the coil. The number of layers is such that the maximal amplitude of the field attains the magnetic saturation range of the body to be demagnetized, whereas the field intensity at the outlet end of the coil amounts to only a few tenths of oersted. In order that the body to be tested slips automatically through the coil body, the coil is mounted preferably at an angle of inclination of less than  $30^\circ$ , so that the steel bodies can be thrown-in at the multi-layer end of the coil. Experiments with a sensitive ballistic galvanometer showed that no remanent magnetism could be ascertained in the demagnetized samples. The movement of the piece to be tested through the coil may be effected also by a mechanical drive at a speed to be adjusted as desired, this being particularly material in respect of the demagnetization of steel bodies of larger size.

OTTO ENGLER.



PUBLISHED

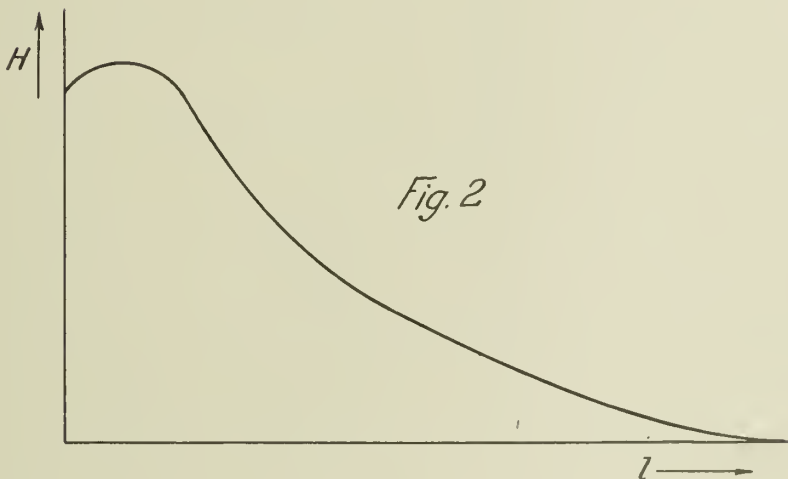
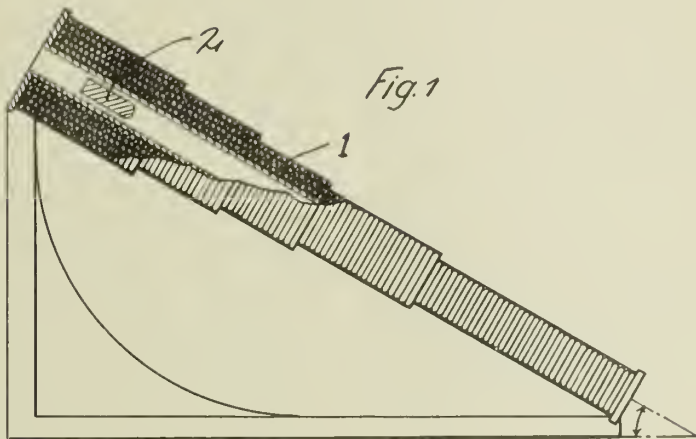
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BY A. P. C.

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# ALIEN PROPERTY CUSTODIAN

## MICROPHONIC TRANSMITTER DEVICES IN PARTICULAR FOR SUBMARINE TRANS- MISSION BY ULTRA SOUNDS

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Alien Property Custodian

Application filed July 10, 1940

The present invention relates to a connection system enabling the potential to be reduced with respect to earth, of microphone transmitter windings in particular of magneto strictive microphones, grouped on the same base.

In such systems the microphones are preferably connected in series and not in parallel, in order to effect the better distribution of the loads.

By such a series connection the least favorable elements are subjected to a high potential, that is to say, at the windings of the microphones which are the furthest away from the earth connection of the circuit, the importance of the potential arises from the reactive terms due to the impedance of the microphones.

The invention consists essentially in reducing the potentials of the microphonic windings with respect to earth, by interposing at various points in their circuit, for example between each microphone or even between the coils comprising the microphone capacities of sufficient value to compensate for the reactance of these various elements.

The invention will be better understood by reference to the annexed drawings which set forth various embodiments thereof merely by way of example.

In Figure 1 the microphones  $M_1$ ,  $M_2$ ,  $M_3$ ,  $M_4$  are excited by alternating current from a source S without the addition of continuous current.

The capacities  $C_1$ ,  $C_2$ ,  $C_3$ ,  $C_4$  are chosen in such manner that they compensate exactly or almost exactly, the self-inductance of each microphone. It will be seen immediately that with this arrangement the total potential at each microphone remains slight, as there are only added together step by step the potentials corresponding to the actual terms of the impedances of the microphone. It is to be furthermore noted that in order still further to reduce the effects of the resultant potential there may be connected to earth  $m$ , as shown on the figure, a point P selected at the electric center or in the vicinity of the electric center of the system, when this connection to earth may be made either directly or through a resistance or resistances.

If the apparatus operates with very high alternating amplitudes, it may happen that the saturation of the microphones is reached and that it is no longer possible to preserve as above, with respect to the source S, a zero phase displacement of the whole of these microphones ( $\cos \phi = 1$ ).

Owing to phenomena of ferro-magnetic resonance which come into play in this case, it is necessary in order to obtain a stable rate of the alternating current, that the circuit of the microphones regarded from the points A and B acts as a capacity, that is to say, presents a displacement of phase in advance of the current over the potential.

Then to re-establish a  $\cos \phi$  (regarded from the source S) equal to unity, there is arranged between the points A and B, as represented in broken lines on Figure 1, a self-inductance L not subject to the effects of saturation.

Figures 2 and 3 relate to the case of microphones used with a supplementary polarisation by continuous current. These microphones thus comprise either a common winding for the continuous current and the alternating current (Figure 2) or separate windings (Figure 3).

In Figures 2 and 3 a portion of the elements is the same as on Figure 1 and such elements are indicated by like letters.

The blocking self-inductances  $l_1$  and  $l'_1$ ,  $l_2$  and  $l'_2$ ,  $l_3$  and  $l'_3$ ,  $l_4$  and  $l'_4$  which are also shown in Figures 2 and 3 are intended to reduce the derivation of the alternating current in the circuit from the continuous current source D. It can be noted that the self-inductance L is of no interest except when the amplitude of the alternating current is sufficiently great with respect to the continuous current.

In Figure 2 the blocking self-inductances  $l_1$  and  $l'_1$ ,  $l_2$  and  $l'_2$ , etc. are represented as separate but obviously if a suitable direction of the windings is maintained, they may be wound on a common core, either for each microphone (as illustrated in Figure 3) or even for the whole of the microphones.

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PUBLISHED

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BY A. P. C.

R. VILLEM

MICROPHONIC TRANSMITTER DEVICES IN PARTICULAR  
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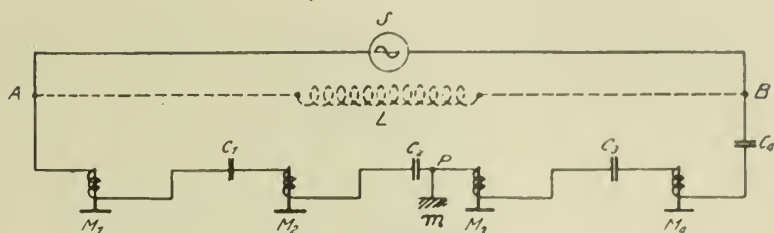


FIG. 1

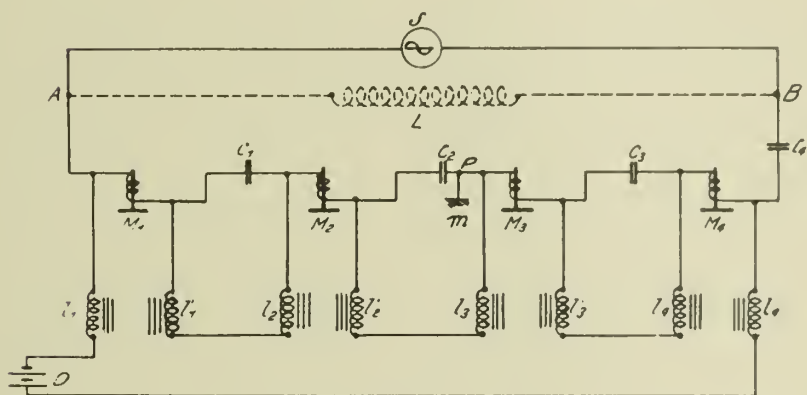


FIG. 2

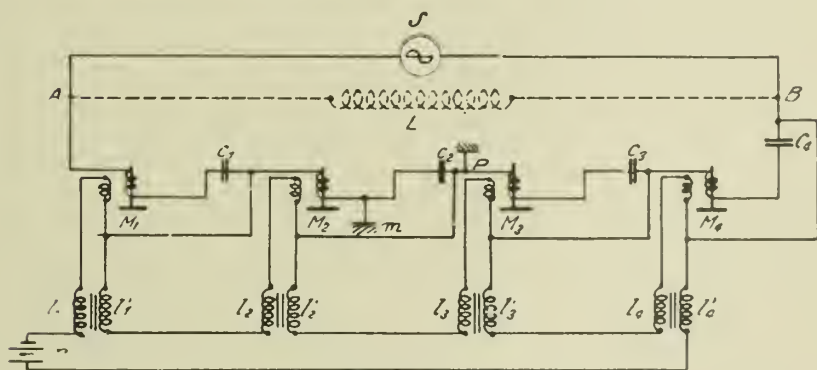


FIG. 3

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# ALIEN PROPERTY CUSTODIAN

## DEVICE FOR DIRECTED RECEPTION OF WAVE MOTIONS

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Application filed July 10, 1940

In the directed reception of wave motions, especially for finding and for determining the direction of the sources of noise in water, the waves received are always accompanied by more or less intense disturbances. These disturbances are particularly aggravating inasmuch as they are mostly subject to great temporary fluctuations of the intensity, and as the ear responds especially to fluctuations of the intensity. Therefore, if the useful optimum intensity does not exceed by a multiple the intensity of the disturbances, it is difficult for the observer to distinguish it from the disturbances.

According to the invention, these disadvantages may be obviated by providing means for calming the temporary fluctuations of the receiving amplitude. Thus, it is attained that the useful amplitudes, if they merely exceed the general disturbance level, do not get lost in the disturbing maxima but are clearly distinguished from the disturbing amplitudes. With an objective, for example optical, indication it is possible to considerably increase the sensitivity of the receiving device or to remove the danger that any disturbing maxima, even of a large amplitude, are indicated.

The calming may be effected by forming a mean value of the receiving amplitudes for a certain period as well as by regulating the intensity in a manner similar to that known in regulating the fading in wireless telegraphy. In receiving devices with an adjustment of the directing vector in the range to be covered, there might be the danger that by moving through the chief maximum, this maximum is levelled by the calming to such a degree that it is not possible to distinguish it from the disturbing sound. In order to avoid such a disadvantageous effect, means may be provided which to a certain degree limit the adjusting speed for the directing vector with respect to the degree of calming in such a manner that the useful optimum sound is not removed by the calming means. For example, in forming the mean value, the adjusting speed for the directing vector may be limited with respect to the degree of calming in such a manner that the fluctuations of the intensity are too slow to be calmed when moving through the useful optimum.

Advantageously, the mean value is only formed for a certain bearing direction, for example by a continuous rapid rotation of the adjusting apparatus or of the directing vector and by co-

ordinating to each adjusting position an indicating or indication control member, which is excited in rhythm with the revolutions of the directing vector by the receiving amplitudes so as to adjust itself to a mean amplitude for several succeeding revolutions of the directing vector. The mean value may be optically indicated. If it is desired to hear the noise received in its natural form, the forming of the mean value may be combined with a rapidly acting fading regulation so as to level the intensity fluctuations and to reproduce the removed useful optimum by the mean value, for example by using a regulating valve.

If the receiving device is provided with a group of receivers, the calming means may be applied at a place, for example in the individual receiving circuits, where the adjusting fluctuations do not yet occur.

The temporary calming of the disturbing level provided according to the invention, not only facilitates finding the direction by the acoustical method of listening, but also secures the advantage to change the hearing reception to an objective indication of the direction of the sources of noise by optical signs and by registration.

Several constructional examples of the invention are illustrated in the accompanying drawing, in which:

Figs. 1a and 1b are diagrams illustrating the effect of the invention,

Fig. 2 is a bearing device with formation of mean values and optical indication,

Fig. 3 is a bearing device with formation of mean values and individual indication for the various bearing directions,

Fig. 4 is a bearing device with fading regulation and formation of mean values, with acoustical indication,

Fig. 5 is a bearing device with a group of receivers and fading regulation in the individual receiving circuits.

In Fig. 1 the sound intensity, when bearing a ship's noise in water, is illustrated in dependence of the direction of the observation place in curve 1, as it will result as receiving intensity, for example by moving a directed receiver over the entire circumference. The point 2 is to indicate the useful sound coming from another ship, the direction of incidence of this sound being required for finding the other ship's place, whereas the remaining portions of the curve illustrate the

disturbing sound caused by the water or the own ship. This disturbing sound is usually subject to intense temporary fluctuations. Although its mean value may be far below that of the useful sound 2, it may easily occur, owing to the temporary fluctuations, that the disturbing maxima become equal to or even greater than the useful sound, so that the latter will be lost in the disturbing maxima and will be very different to hear as useful sound in the disturbing maxima when turning the receiving device.

These influences of the disturbing sound or of its temporary fluctuations of intensity are avoided in the bearing device illustrated by suppressing the temporary fluctuations by the formation of mean values or by fading regulation; thus, a bearing curve 3 with a useful sound 4 will result as in Fig. 1b.

Figs. 2 to 5 show connections of bearing devices in which the calming of the temporary fluctuations of intensity is obtained in different ways.

In the constructional example shown in Fig. 2, the calming is effected by forming for a certain period the mean value of the continuous voltage resulting from the receiving voltage after being amplified in an amplifying tube 5 and rectified in a rectifier 6, this mean value being indicated in a tube voltmeter 7.

The input of the receiving amplifier is connected to a group of five receivers 8, which are fixed, for example, in the planking of the ship, and whose directing vector may be moved over the circumference in a manner known per se by inserting retarding lines of different lengths between the individual receivers and the common receiving circuit 9 in a compensator 10 with a hand wheel and a direction indicator 11.

The length of the period, for which the mean value is formed, is determined by a time circuit consisting of a charging resistance 12, a condenser 13, and a leakage resistance 14. It is obvious that the adjustment of the directing vector at the compensator 10 must be effected slowly enough to obtain an effective formation of the mean value of the useful optimum. The time constant of the formation of the mean value may be automatically influenced in dependence of the adjusting speed, or a certain adjusting speed may be predetermined.

The formation of a mean value for a long period with a high adjusting speed may be obtained by providing, as shown in Fig. 3, a larger number of condensers 15 or other storage members coordinated to the various bearing directions, the storage members being successively connected to the rectifier 6 by a contact device 16 coupled to the adjusting device and by a collector 17. A rigid or flexible shaft *a* serves to couple the adjusting device to the contact device 16. The directing vector is continuously rotated by mechanical driving means at a comparatively high speed, the individual condensers receiving with each revolution one charging current impulse according to the existing receiving amplitude. The leakage resistances 18 are so adjusted that mean voltages at the condensers 15 are obtained for several revolutions of the directing vector. The voltages at the condensers 15 are measured by a tube voltmeter 19 which may be successively connected to the individual condensers by means of a hand switch 20. It is also possible to co-ordinate a special tube voltmeter or other voltage measuring member to each condenser 15, or the

voltages may be tapped in rapid succession by a Braun-tube with simultaneous deflection of the bearing direction, resulting in a permanent indication of the mean receiving amplitude of all directions.

With the indication of the mean value of the continuous voltage according to Figs. 2 and 3, the tone character of the noise received is lost. But in case of intense disturbances, the tone or other sound character often is an important sign. Fig. 4 shows a connection in which the noise received may be heard in spite of the formation of a mean value. For this purpose, the mean value of the continuous voltage, formed in an amplifier 21 with the adjoining rectifier 22, is not directly indicated but is used for the dynamical regulation of the intensity of sound of the noise levelled by fading regulation in a second amplifier 23 connected in parallel, by applying the mean value of the continuous voltage as positive grid bias to an amplifying tube 24 lying behind the fading regulation. Then, the mean value of the amplitude of the natural noise may be heard in a telephone 25. In this case, the fading regulation of the amplifier 23 may be omitted.

As shown in Fig. 4 on the left, the receiving device may be adjusted by mechanical turning in the various bearing directions instead of by adjustable electric retarding members. In this case, there may be provided a single oscillator 26, preferably with a strip-shaped receiving surface 27 for obtaining the horizontal directing effect, rotatable about a vertical axle 28 connected with a direction indicator 29.

In group listening devices, a fading regulation independent of the adjusting speed may be effected by inserting, as shown in Fig. 5, the fading regulation in front of the adjusting device in the branches of the individual receivers. In this case, preliminary tubes 30 are inserted in the individual receiver circuits. The voltage for regulating the preliminary tubes may be derived, as provided in the example, from one single receiver, for example by a two-stage amplifier 31, 32 with an adjoining rectifier 33, and applied via a common line 34 to all preliminary tubes 30 as negative bias for the fading regulation. In this case, the bearing adjustment may be effected either mechanically by turning the receiver group 8, 8 . . . or, as shown in the drawing, by artificial turning with the aid of a compensator 10.

Of course, the invention is not limited to the examples illustrated, as various modifications and other constructions are possible. In particular, the bearing devices may advantageously be provided with devices for registering the receiving amplitude. It is also possible to effect a calming of the receiving amplitude by forming a mean value not influenced by the bearing adjustment by providing a larger number of fixed directed receivers for the various bearing devices. In this case, each individual receiver may be provided with a separate indicating device, or a common indicating device may be successively connected to the individual receiving circuits. Furthermore, a calming according to the formation of a mean value may be provided in the individual receiver circuits of a group listening device, in which case the calming must be effected in such a manner that the noise frequencies to be heard are not levelled thereby.

If necessary, a calming may be effected behind the adjusting device by fading regulation.

In order that, in this case, the useful sound to be ascertained should not also be levelled by the

fading regulation, the latter must operate so slowly that the useful sound optimum is not influenced when the receiving vector is turned. Of course, all intensity fluctuations increasing and decreasing with the same speed as the useful optimum, will not be influenced by the fading regulation, but merely the slower fluctuations. 5

If the directing vector at the condenser is arbitrarily adjusted by hand, it is possible, if desired, to automatically accelerate or retard the 10

fading regulation with the adjusting speed. But it is also possible to provide mechanical driving means for the compensator in order to secure a constant adjusting speed.

The fading regulation may, as known from the wireless technics, be connected with a device for removing the clicking.

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DEVICE FOR DIRECTED RECEPTION  
OF WAVE MOTIONS  
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2 Sheets-Sheet 1

FIG. 1.

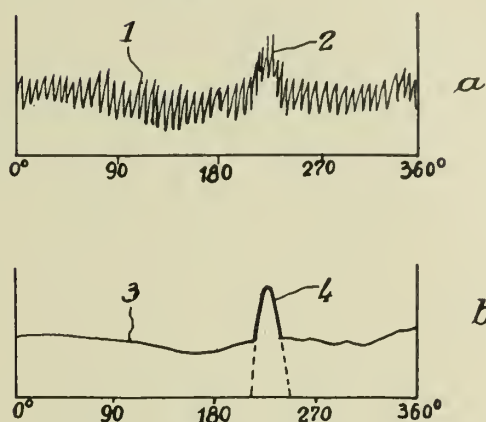
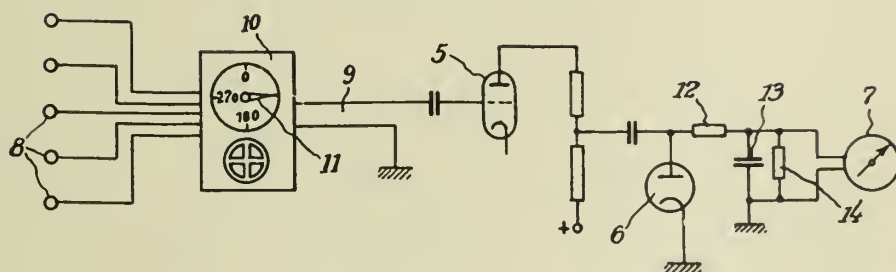


FIG. 2.



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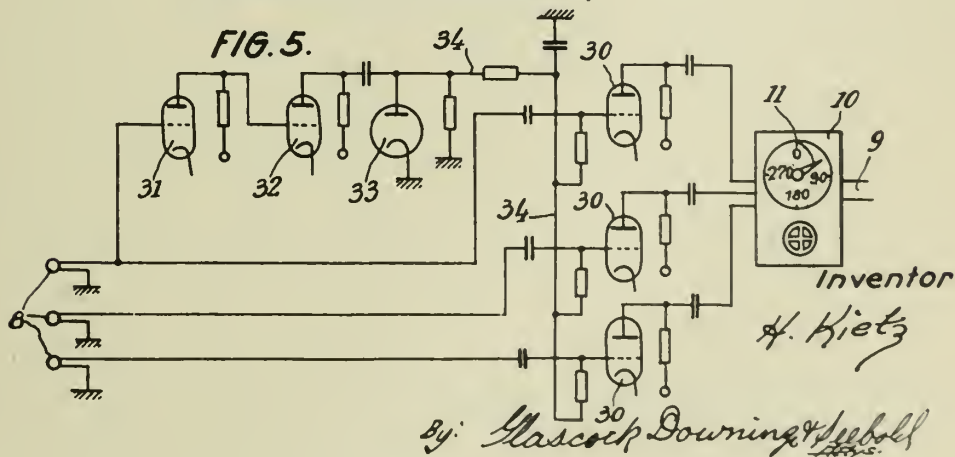
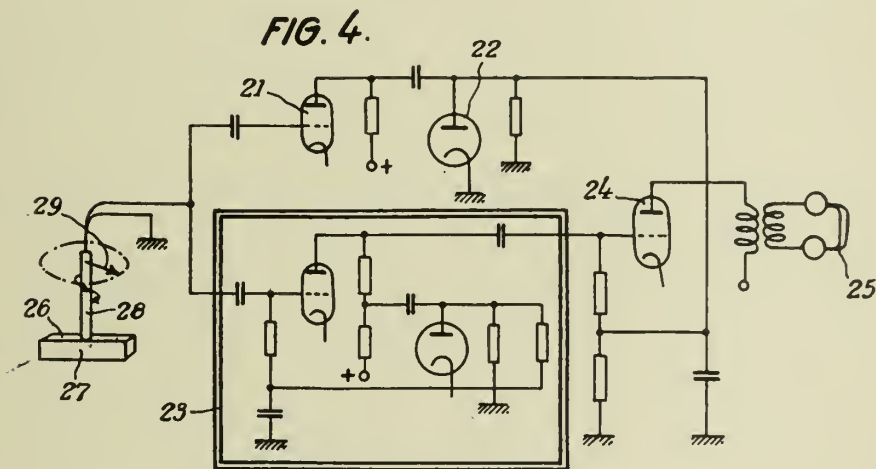
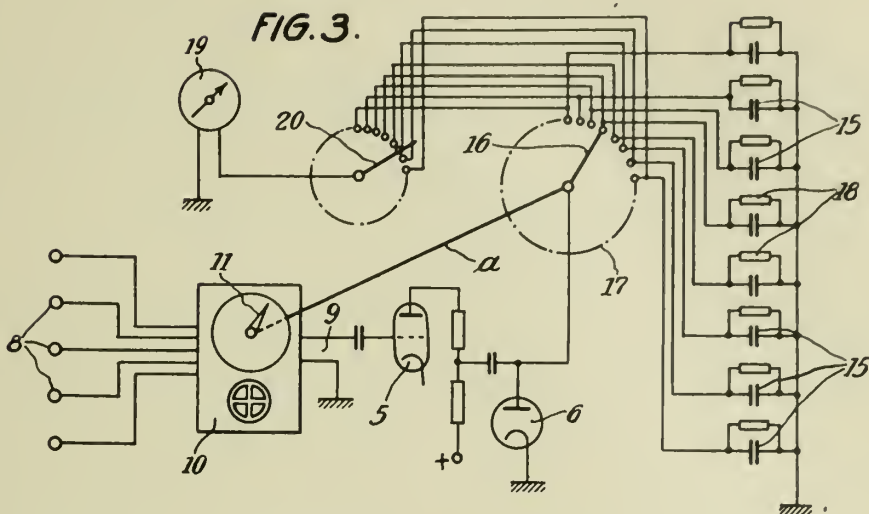


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DEVICE FOR DIRECTED RECEPTION  
OF WAVE MOTIONS  
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2 Sheets-Sheet 2





ALIEN PROPERTY CUSTODIAN

FILTERS

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Application filed July 11, 1940

This invention relates to filters and more particularly to filters having a lattice type four-terminal network comprising two reactance elements and two resistances in combination and has for its object to provide a voltage filter easier in both the manufacture and the adjustment, but the voltage filter characteristic being substantially equal to that of the symmetrical lattice type filters commonly used.

The common filter heretofore in use is provided by the circuit of a four-terminal network solely comprising reactance elements to transmit the power within a certain range of frequencies, the power beyond the range of frequencies being attenuated or not being transmitted. The resistance component of the circuit is minimised to provide against resistance loss. The operation characteristics and theory in the design of the circuit has fully been studied by Caucr and others, and the circuit has been found theoretically very satisfactory as a filter, but in order to provide a satisfactory attenuation in one section by the use of the circuit, the reactance elements must be manufactured with high accuracy and accurately adjusted in tuning, and consequently, the manufacture of the circuit is considerably difficult and after its completion the adjustment is substantially impossible. Owing to these difficulties, the circuit is not used in general with satisfaction, though it is satisfactory on the theory in the design.

In accordance with the invention there is provided a filter circuit easy in manufacture and adjustment, which is provided by a lattice type four-terminal network comprising two reactance elements and two resistances in combination to be operated with output terminals in nearly opened condition.

The nature of the invention will be more fully understood from the following detailed description and by reference to the accompanying drawings, of which;

Fig. 1 shows a circuit diagram of a filter heretofore in use;

Fig. 2 shows a filter circuit diagram embodying the invention;

Fig. 3 shows a low-pass filter circuit diagram embodying the invention;

Fig. 4 shows an alternative filter circuit diagram;

Fig. 5 shows another alternative filter circuit diagram; and

Fig. 6 shows the frequency-attenuation curves.

In Fig. 1 the conventional filter circuit shown as typical one comprises reactance elements  $Za$ ,

$Za$ , one being inserted between terminals 1 and 2 and the other between other terminals 1' and 2', and other reactance elements  $Zb$ ,  $Zb$ , one being connected across the terminals 1 and 2' and the other across the terminals 2 and 1'. In this case, the reactance elements  $Za$ ,  $Za$  and  $Zb$ ,  $Zb$  must be manufactured and adjusted in tuning with high accuracy, in order to provide a satisfactory attenuation in one section, and consequently the manufacture of the circuit is considerably difficult and after its completion, the adjustment is substantially impossible, as mentioned above.

Coming now to a description of the circuit according to the invention with reference to Fig. 2 which illustrates one embodiment of the invention, the circuit comprises a reactance element  $Za$  inserted between an input terminal 1 and an output terminal 2, another reactance element  $Zb$  connected across the input terminal 1 and another output terminal 2', a resistance  $Ra$  connected across another input terminal 1' and the output terminal 2 and another resistance  $Rb$  inserted between the input and the output terminals 1' and 2' to form a four-terminal network. The resistances  $Ra$  and  $Rb$  may be of any desired values, and now for the sake of simplicity the both value is assumed to be one ohm.

In this circuit, assuming that  $V_1$  represents the voltage impressed across the input terminals 1 and 1', and  $V_2$  represents the voltage across the output terminals 2 and 2', the effective voltage transmission ratio is given by the following formula:

$$\frac{V_2}{V_1} = \frac{Zb - Za}{(Zb + 1)(Za + 1)} \tag{I}$$

In the formula, when

$$\sqrt{ZaZb} \div 1 \tag{II}$$

we have:

$$\frac{V_2}{V_1} = \frac{1 - Zb}{1 + Zb} \tag{III}$$

and

$$\left| \frac{V_2}{V_1} \right| = \left| \frac{1 - Zb}{1 + Zb} \right| = 1 \tag{IV}$$

viz., when  $\sqrt{ZaZb} \div 1$ , the effective voltage transmission ratio will be unity and the voltage attenuation will be zero. In the formula (I), when

$$\sqrt{\frac{Za}{Zb}} \div 1 \tag{V}$$

we have:

$$\frac{V_2}{V_1} \div 0 \tag{VI}$$

It follows that the voltage completely attenuates

and consequently the essential in design of the circuit according to the invention resides in approximating the value of  $\sqrt{ZaZb}$  to unity in the voltage transmission band, and in approximating the value of

$$\sqrt{\frac{Za}{Zb}}$$

to unity in the attenuation band, under the consideration of the voltage transmission only and it is apparent that the circuit designed in this manner will bring about a satisfactory voltage filter action.

It will be now seen that the relation between the reactance elements  $Za$  and  $Zb$  in the formulas (II) and (V) bears a resemblance to the relation between the reactance elements  $Za$  and  $Zb$  in the symmetrical lattice-type network (which will hereinafter be referred to as "Cauer circuit") as shown in Fig. 1.

In the Cauer circuit,

$$\left. \begin{aligned} \sqrt{ZaZb} &= Zo \\ \sqrt{\frac{Za}{Zb}} &= \tanh \frac{\theta}{2} \end{aligned} \right\} \quad (VII)$$

Where

$Zo$  is the image impedance.

$\theta$  is the attenuation constant.

Cauer observed that it is the indispensable condition to keep the value of  $Zo$  in the transmission or passing zone at constant and to approximate the value of  $\tanh$

$$\frac{\theta}{2}$$

in the attenuation zone to unity, and to derive the calculating formulas of  $Za$  and  $Zb$  to meet the condition. Such Cauer circuit is, however, the circuit solely comprising the reactance elements  $Za$  and  $Zb$  and is quite distinctive from the circuit according to the invention, which comprises the reactance elements  $Za$  and  $Zb$  and the resistances  $Ra$  and  $Rb$ , the resemblance between both being found only in the relation between the reactances  $Za$  and  $Zb$ .

According to the invention, the values of  $Za$  and  $Zb$  to meet the formulas (II) and (V) are determined from the said calculating formulas derived by Cauer, by taking advantage of the resemblance between the relation between  $Za$  and  $Zb$  in the circuit according to the invention and that between those in the Cauer circuit, and thus determined values of  $Za$  and  $Zb$ , and any desired values of  $Ra$  and  $Rb$ , for example 1 ohm, are used, whereby satisfactory attenuation or voltage filter action is obtained.

When the input impedance of the circuit according to the invention on the side of the input terminals 1 and 1' is represented by  $Z_{11}$ ,

$$Z_{11} = \frac{(1+Za)(1+Zb)}{2+Za+Zb} \quad (VIII)$$

In the transmission zone, substituting in the equation (VIII) the equation (II), that is,

$$\sqrt{ZaZb} \div 1$$

we have:

$$Z_{11} = 1 \quad (IX)$$

Thus, in the voltage transmission zone, the input impedance  $Z_{11}$  is 1 ohm and hence constant, independently of frequency.

In the attenuation zone, substituting in the Equation (VIII) the Equation (V), that is,

$$\sqrt{\frac{Za}{Zb}} = 1$$

we have:

$$Z_{11} = \frac{1}{2}(1+Za) \quad (X)$$

Thus, in voltage attenuation zone, the input impedance  $Z_{11}$  is not constant, and includes resistances.

In the above, the values of  $Ra$  and  $Rb$  has been assumed to be 1 ohm for simplicity, but in the circuit according to the invention, substituting  $Za'$  and  $Zb'$  derived from the following equations for  $Za$  and  $Zb$  respectively:

$$\left. \begin{aligned} Za &= \frac{Za'}{Ra} \\ Zb &= \frac{Zb'}{Rb} \end{aligned} \right\} \quad (XI)$$

where

$$Ra \div Rb \div R$$

the transmission characteristics remain unaltered, while the input impedance  $Z_{11}$  alters into  $Z_{11}'$  as given by

$$Z_{11} = \frac{Z_{11}'}{R} \quad (XII)$$

The values of  $Ra$  and  $Rb$  need not, therefore, be 1 ohm, and may be any desired value.

In the circuit according to the invention, it is desired that the value of  $Ra$  is equal to that of  $Rb$ , but  $Z_{11}$  is not substantially affected by a slight difference between  $Ra$  and  $Rb$ , which may be an error in the manufacture. A slight change of  $Ra$  may cause a slight change of the relative value of  $Za$  and  $Zb$  (see the Equations XI). This holds good with  $Rb$ . The attenuation characteristics may be determined by the value of  $(Za-Zb)$ , as seen from the Formula (I), and in the attenuation zone it is desired to be

$$\frac{Za}{Zb} \div 1$$

that is,  $Za \div Zb$ , but  $Za$  can not be approximated to  $Zb$  as desired in view of the technical skill on the manufacture of coils and condensers. The fact gives rise to the fatal disadvantage in the Cauer circuit solely comprising  $Za$  and  $Zb$ . On the contrary, in the circuit according to the invention, it is apparent from the foregoing that the relative connection of  $Za$  and  $Zb$  or the attenuation characteristics may easily be adjusted by a slight regulation of  $Ra$  and  $Rb$ , and consequently the circuit may easily be manufactured. Fig. 6 illustrates the attenuation characteristics, in which curve A in dotted line represents the undesirable characteristic when there is a slight difference between  $Za$  and  $Zb$  on the manufacture, and curve B represents the improved characteristic when  $Ra$  is slightly regulated.

Fig. 3 illustrates an application of the circuit as shown in Fig. 2 as a low-pass filter (transmission) by way of example.

Fig. 4 illustrates an alternate embodiment of the invention, in which the reactance element  $Za$  is inserted between the input and output terminals 1 and 2, the reactance element  $Zb$  between the other input and output terminals 1' and 2', as series elements, and the resistance  $Ra$  is connected across the output terminal 2 and the input terminal 1', the resistance  $Rb$  across the input terminal 1' and the output terminal 2, as

shunt elements. In this circuit, assuming that  $V_1$  is the voltage impressed across the input terminals 1' and 1 and  $V_2$  is the voltage across the output terminals 2 and 2', we have:

$$\frac{V_2}{V_1} = \frac{1 - ZaZb}{(1 + Za)(1 - Zb)} \quad (XIII)$$

and if

$$\sqrt{VaVb} \doteq 1 \quad (XIV)$$

$$\frac{V_2}{V_1} \doteq 0$$

where is attenuation;  
if

$$\sqrt{\frac{Va}{Vb}} \doteq 1 \quad (XV)$$

$$\left| \frac{V_2}{V_1} \right| \doteq \left| \frac{1 - Za}{1 + Za} \right| \doteq 1 \quad (XVI)$$

where is transmission zone and is no attenuation, and the filter characteristic is the reversal of that in the circuit as shown in Fig. 2. The input impedance  $Z_{11}$  is the same as that in the circuit as shown in Fig. 2 and given by the formula (VIII), and is constant in the attenuation zone, while it is given by the formula (X) in the transmission zone. This circuit may also be easily manufactured and adjusted similarly to the circuit as shown in Fig. 2, and bring about satisfactory attenuation or voltage filter action.

In the circuit as described above,

$$\frac{1}{Za}$$

and

$$\frac{1}{Zb}$$

may be used respectively in place of  $Za$  and  $Zb$  without altering the transmission characteristics, and in this case the input impedance  $Z_{11}$  is constant in the attenuation zone, and in the transmission zone will be

$$Z_{11} = \frac{1}{2} \left( 1 + \frac{1}{Za} \right) \quad (XVII)$$

The circuit shown in Fig. 4 may be connected to the circuit shown in Fig. 2 in parallel as shown in Fig. 5. In this case, the input impedance of the circuit is constant, it being  $\frac{1}{2}$  ohm, in either case  $\sqrt{ZaZb} = 1$ , or

$$\sqrt{\frac{Za}{Zb}} = 1$$

and consequently the circuit shown in Fig. 5 may be used as an analyzer.

With the circuit according to the invention, a slight loss due to the use of the reactance elements is also avoidable, but the resistance component of one of the reactance elements is higher than that of the other reactance element, the resistance necessary for the balancing of the reactance elements may be added to the other reactance element, so that the attenuation characteristics may be prevented from declining. It will be understood that the equivalent circuits of magnetostriction oscillator, crystal oscillator, mechanical oscillator etc. substantially similar to a reactance circuit may be used as the reactance elements of the circuit according to the invention, and that the circuit according to the invention may be utilized as a retardation circuit for voltage.

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MAY 18, 1943.

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FILTERS

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Fig. 1.

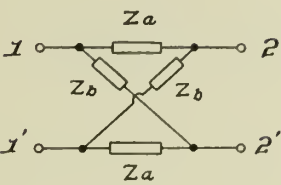


Fig. 2.

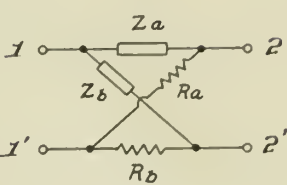


Fig. 3.

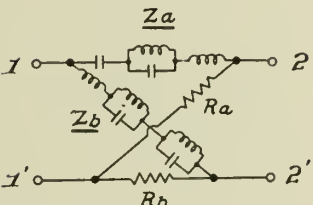


Fig. 4.

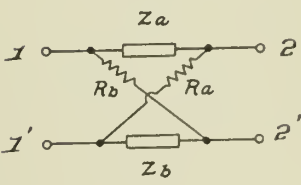


Fig. 5.

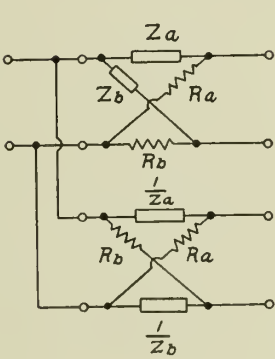
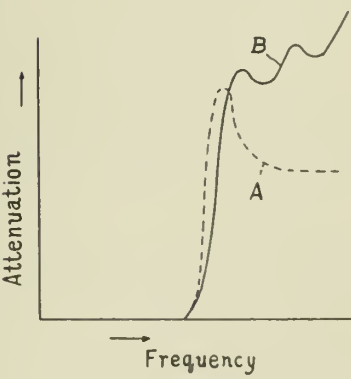


Fig. 6.



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# ALIEN PROPERTY CUSTODIAN

## VARIABLE PITCH AIR PROPELLER

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Application filed July 12, 1940

The present invention relates to variable pitch air propellers in which the position of the blades is altered by a gear arranged in the hub, said gear being driven by a hollow shaft surrounding the shaft of the air propeller.

In the first developed automatic variable pitch air propellers this was effected by the use of centrifugal weights which were connected to the propeller blades. A definite position of the centrifugal weights corresponded to a definite position of the blades and the power for adjusting the blades was supplied by the centrifugal weights themselves. With higher motor outputs, however, the power required for adjustment will be so large that an auxiliary device for supplying the power necessary for the adjustment of the blades will be required while the centrifugal weights act as a centrifugal governor only controlling the auxiliary power for adjusting the propeller blades.

Hitherto the auxiliary power for instance has been obtained by arranging in front of the propeller a blade wheel driven by the relative air current or by arranging upon the hub of the propeller an electromotor which was supplied with current by means of slip rings.

All these known devices, however, have the drawback that a rather complicated construction is required if a limitation of the adjustability to a few steps only is not included in the bargain, but a stepless adjustment if possible as far as to the fathering- or idle running position is to be obtained. The interior of the propeller hub which itself is rather difficult to manufacture is provided with cross walls, bearings and other irregularities in the form and in the hub a gear drive is provided having a large number of gears as well as a corresponding large number of individual elements. This considerably increases the weight of the total propeller and calls into question the entire reliability of service.

The present invention is concerned with a stepless automatically operating variable pitch propeller in which for the adjustment of the blades an auxiliary power is used, whereas a centrifugal governor controls the auxiliary power only. The object of the present invention is to considerably simplify the construction, particularly the construction of the hub.

In connection with variable pitch propellers used for driving vessels or boats it is already known to arrange in the hub of the propeller a gear acting upon the rotatably mounted feet of the blades, to effect, however, the drive of this gear by a hollow shaft surrounding the propeller shaft. With this known construction, however,

the adjustment could only be effected by arbitrary operation by hand, for which purpose the hollow shaft had to be axially displaced. The problem of automatic stepless adjustment of the propeller blades was, therefore, not solved by this construction.

According to the present invention the problem in question is solved mainly by the fact that for producing the movement of adjustment a stationary device driven by the shaft of the propeller itself is provided. This adjustment device, therefore, is an additional constructional part arranged outside the hub, whereby the manufacture of the hub is very simplified and the weight thereof considerably reduced. A further advantage results from the fact that the device for producing the power of adjustment is no longer subjected to the centrifugal weights and, therefore need not be balanced absolutely exactly. The control of the device supplying the power of adjustment preferably is effected by a centrifugal governor.

Further features and advantages of the invention result from the following specification and the accompanying drawings.

In these drawings:

Fig. 1 shows a diagrammatic cross section through a first construction provided with an electrically operated adjusting device,

Fig. 2 is a diagram of the connections of the adjusting device of the modification shown in Fig. 1,

Fig. 3 shows a second modification provided with a hydraulically operated adjusting device,

Fig. 4 shows diagrammatically and on a large scale details of the modification illustrated in Fig. 3,

Fig. 5 shows a further modification provided with a mechanically operated adjusting device,

Fig. 6 is a section on line VI—VI of Fig. 5, and

Fig. 7 shows a further modification partly in section.

In all the figures the front end of an aircraft motor having an adjustable pitch propeller is shown. To simplify the understanding of the invention such details only are described and provided with reference characters which are directly connected to the invention.

Flanged to the motor casing 1 is a casing 3 surrounding the shaft 2 of the air propeller. By means of a nut 5' the hub 5 of the air propeller is fixed upon the cone 4 of the propeller shaft 2. In lugs or projections 6 of the hub of the propeller the propeller blades 7 are rotatably mounted in a manner known per se. At the foot of the propeller blade 7 a worm 8 engages a toothed ring not

shown in the drawings and provided at the foot of the propeller blade. Mounted upon the one end of the worm 8 is a gear wheel 9 engaging with a gear wheel 10 rotatably mounted upon the shaft 2. By means of claws 12 the hub of the gear wheel 10 is coupled to the hub of a gear wheel 11 also rotatably mounted upon the shaft 2. Adjacent the gear wheel 11 a gear wheel 13 is fixed upon the shaft 2 and this gear wheel 13 engages a gear wheel 14 arranged upon the shaft of a dynamo-electric machine 15 mounted at the motor casing 1. Opposite the dynamo-electric machine 15 the electric driving motor 16 is mounted in the casing 3 and with the armature of this motor 16 the gear wheel 17 rotates which engages the gear wheel 11 mounted upon the shaft 2.

For the control of the adjustment a centrifugal governor 18, driven in dependence on the number of revolutions of the motor, is provided. This governor is driven in a well known manner by means of its gear wheel 19 by the gear wheel 13 fixed upon the shaft 2. The governor spring 20 may be influenced by way of the rotatable cam 21 by hand or by another control member so that the resistance, offered to an alteration of the position of the centrifugal weights, may arbitrarily be altered. The control rod 22 which may axially be displaced by the centrifugal weights acts upon the electric governor 22 which preferably is constructed as a shunt governor.

The operation of the described device is as follows:

If the shaft 2 rotates the dynamo-electric machine 15 is driven by means of the gear wheel 13 and the gear wheel 14 engaging with the wheel 13. The dynamo-electric machine 15 is connected by way of electric conductors to the driving motor 16, the gear wheel 17 of which, connected to the armature, engages with the gear wheel 11. The latter may freely rotate about the shaft 2 and is, by means of the clutch 12 connected to the gear wheel 10 with which the gear wheel 9 is in engagement. The wheel 9 drives the worm 8 which, on being rotated, adjusts the blade 7 by way of a worm wheel not shown in the drawings and arranged at the foot of the blade. Corresponding driving means are provided for the other blades also.

The electrical arrangement is such that at a definite number of revolutions of the motor the dynamo-electric machine 15 and the motor 16 driven by the latter are rotated with the same number of revolutions. If with the chosen same ratio of gearing between the wheels 13 and 14 as well as the wheels 11 and 17 the driving motor 16 is rotated with the same number of revolutions as the dynamo-electric machine 15, the wheel 11 is rotated but does not revolve relatively to the shaft 2. Consequently, the worm 8 is not driven and the propeller blade maintains its position. If now, in any desired manner the number of revolutions of the driving motor is altered with regard to that of the dynamo-electric machine the wheel 11 rotates with regard to the shaft 2 and the gear effecting the adjustment of the propeller blade 7 is rendered operative. If the motor runs faster than its driving machine then the gear wheel 11 leads with regard to the shaft 2. If, however, the motor runs slower than its driving machine then the gear wheel 11 lags. Hereby the air propeller blade 7 is rotated in another sense, i. e. in a sense of increase or decrease of the pitch angle.

The alteration of the number of revolutions of the driving motor relatively to that of the dynamo-electric machine preferably is effected in a well known manner by an electric shunt governor 23, for instance by the use of the Leonhard-connection. For this purpose preferably the centrifugal governor 18 with the governor rod 22 is used, which governor by way of the governor spring may be influenced by hand or by other control means.

Fig. 2 shows the use of the well known Leonhard-connection for the control arrangement of the air propeller. The armature 24 of the dynamo-electric machine is by way of the conductors 25, 27 short-circuited with the armature 25 of the driving motor. The field winding 28 of the motor is connected to the mains 29, 30 only, while in the circuit of the field winding 21 of the dynamo a shunt governor 32 is connected. By means of this well known connection not only a very exact control of the number of revolutions of the motor but also such a control extending over a large range may be effected.

In the construction shown in Fig. 3 the electrical adjusting device illustrated in the modification just described is replaced by a hydraulic device.

In this case the gear wheels 13 and 14 serve for driving an oil pump which for instance is provided with a suction pipe 36 leading from the oil sump of the motor and with a feed pipe 37 which discharges into the control channel 38 of the control casing 39. From the control cylinder arranged in the casing 39 the pressure pipe 41 leads to a pressure oil motor 42 by way of the control channel 40.

Compared with the pressure oil motor 42 the oil pump 35 is so dimensioned that the amount of oil under pressure supplied is sufficient to drive the motor 42 with a number of revolutions which is higher than its own number of revolutions. If the air propeller blades are to maintain their position then with the same ratios of gearing synchronism of the oil pump 35 and of the pressure oil motor 42 is to be taken for granted. This is obtained by throttling a portion of the oil under pressure at the entrance into the control channel 40 whereby simultaneously a corresponding amount of oil under pressure is discharged by the channel 43 of the discharge pipe 44. It may sometimes also be preferable to use a single control opening corresponding to the channel 43 only, whereas the control channels 38 and 40 are permanently connected to each other by the cylinder in which moves the control slide 45.

The spent oil of the motor 42 returns by way of the discharge pipe 46 to the oil tank, preferably to the oil sump of the motor, in order to be used again.

Fig. 4 shows on a larger scale a special construction of the control device arranged between the oil pump and the pressure oil motor. 48 is an oil pump, for instance of the kind of a gear pump, provided with a driving wheel 14. This pump supplies oil under pressure by way of the pipe 37 into the control cylinder 39 in which the distribution towards the control channel 41 and the discharge pipe 46 is effected by means of the control slide 45. If shifted as far to the left as possible, the slide 45 completely opens the channel 41 leading to the pressure oil motor 42, the overflow channel 46 simultaneously being closed. In accordance with the displacement of the cylinder towards the right under the action of the centrifugal governor or other control members, for instance by hand, throttling is effected at the channel 41, whereas simultane-

ously the overflow opening 46 is correspondingly opened. In this manner the motor 42 may with regard to its number of revolutions be so controlled that the members effecting adjustment of the air propeller blade start moving in the one or the other sense.

Figs. 5 and 6 show a further modification according to which the drive of the members effecting the adjustment directly is obtained mechanically by way of a differential gear, each of the members engaging the differential wheels being controlled by an oil pressure brake associated therewith.

Upon the air propeller shaft 2 a plurality of bevel gear wheels 51 is mounted upon stationary bolts 50 and bevel gear wheels 52, 53 rotatably mounted upon the shaft 2 engage with these bevel gear wheels 51. These two bevel gear wheels 52, 53 are connected with a toothed rim 54 and 55 respectively. The toothed rim 55 is connected in the manner described above with the adjusting gear mounted in the air propeller hub. By way of spur wheels 56, 57 the spur wheels 54, 55 drive the spur wheels 58, 59 of two oil brakes constructed in the manner of gear wheel pumps. This control and regulating device preferably is directly connected to the oil brakes and the two devices are shown separated from each other in Fig. 5 for the sake of clearness only.

Fig. 6 shows in a section on line VI—VI of Fig. 5 a construction of the above mentioned brake device with governor and control by hand. The oil brakes 58 and 59 are, by way of a pipe system 63, supplied with oil from storage tanks not shown in the drawings or from the oil sump of the motor. The oil flows through the conduits 64, 65 and through the control cylinder into the collecting pipe 66 and back again through an oil cooler into the storage tank. Only if the control slide 67 occupies the centre position shown in Fig. 6 may the oil flow without resistance being offered. If the slide 67 is shifted for instance towards the left, then the oil must flow from the channel 65 into the channel 68 in which an overpressure valve 69 or a nozzle is arranged. The resistance of this valve acts upon the adjusting gear 57 and 55 in the manner of a brake so that a relative movement between the shaft 2 and the gear wheel 55 occurs. If the slide 67 is shifted towards the right, the brake 58 mounted at the right-hand side comes into operation. The resistance of the valve 69 may be altered in a simple manner by the lever 70 acting upon the valve spring and adapted to be affected by hand or by special control means. The lever 70 may also be adjusted together with the lever 71 belonging to the centrifugal governor.

By adjusting the lever 70 controlling the loading of the valve cone 69 a change from slow gear to fast gear may be effected. Preferably, besides the adjustment to ordinary adjusting speed an adjustment for higher adjusting speed is provided. If instead of the valve 69 a nozzle is provided then the opening of the nozzle and thereby the resistance thereof may be altered by adjustment.

The operation of the device is as follows:

If the motor runs with a constant number of revolutions and if there is no reason for altering the position of the propeller blades, both oil brakes run idle, i. e. the oil sucked in and fed by both oil brakes flows in a circuit without appreciable resistance being offered thereto. If by means of the control slide 67 the stream of oil

is throttled at the left- or right-hand side, then a brake action occurs by which for instance the wheel 55 rotating hitherto with the number of revolutions of the shaft 2 is caused to run slower and to act upon the position of the blades by way of the adjusting gear. If, however, a braking action is applied to the gear wheel 54, the relative movement is, by way of the planet pinions 51, transferred upon the adjusting gear in a reverse sense of rotation. In this manner the blades may selectively be rotated in the one or the other sense by hand or automatically by the centrifugal governor. The number of revolutions of the governor depends on the number of revolutions of the motor. In Fig. 5 the driving wheel 72 of the governor is fixed upon the bolt 50 of the planet pinions.

In the modification shown in Fig. 7 the power derived from the motor shaft 12 is directly used for adjusting the air propeller without employing the power transformers described in connection with some of the above modifications which transform the power occurring first as rotary movement into pressure or electric power which in turn is transformed into rotary movement. Nevertheless, in the modification according to Fig. 7 also the main inventive idea is reduced to practice, i. e. a stationary device driven by the air propeller shaft itself is provided for automatically producing the adjusting movement.

As in the modifications already described in this case also the means for driving the centrifugal governor 18 is a toothed rim 13a mounted upon the air propeller shaft 2 which, however, in the present case has a second toothed rim 15. The drive of the governor is effected in the same manner as described in connection with the other construction but a special toothed rim 13b directly mounted upon the air propeller shaft 2 is provided adjacent the toothed rim 15. These two drive gears act upon two groups of back gears which are independent on each other and may selectively come to action. The purpose of arranging two back gears is to allow the adjustment of the air propeller blades with various speeds. For special cases a quick adjustment of the blades seems to be necessary. For the normal operation of the adjusting gear in dependence on the automatically operating governor such a quick adjustment, however, has the drawback that an "over-control" of the blades may occur, i. e., that an adjustment once initiated is continued if the automatically operating governor is again in its state of equilibrium. By a slower adjustment of the blades which is possible in this modification by the special second back gear such an over-control is prevented.

Below the back gear for the fast gear of the adjusting device will first be described:

A gear wheel 77 the opposite end of the shaft 78 of which is rigidly connected to the clutch disc 79 engages the gear wheel 13 mounted on the main shaft 2. Rotatably mounted upon the shaft 78 is a gear wheel 81 provided with claws 80. Between the latter and the disc 79, also provided with claws, a gear wheel 82 is axially displaceably mounted upon a sleeve 84. The gear wheel 82 carries claws 83 at both sides and engages with the gear wheel 11 to which the wheel 10 is coupled in the manner already described.

The gear wheel 82 is connected to a pressure piston 85 arranged in the interior of the hollow shaft 78. For this purpose the piston rod 86 is provided with a cross rod 87 movably arranged in

slots of the shaft 18. The cross rod 87 extends through the sleeve 84 and carries the same with it when being axially displaced. The piston 85 is operated by oil under pressure in a manner to be later described and is influenced by a control slide. Preferably, the piston 85 is, by means of springs, maintained in its middle position as long as the oil pressure acting upon one side of the piston does not cause displacement of the piston into another position. If now the control causes shifting of the gear wheel 82 towards the left, then the claws 83 engage with the corresponding claws provided at the clutch disc 79, i. e. the wheel 32 is rotated with the same speed as the gear wheel 77. The ratio of gearing between the gear wheel 13 mounted upon the shaft 2 of the air propeller and the gear wheel 77 arranged upon the shaft 18 of the back gear and, moreover, the ratio of gearing between the gear wheel 82 and the gear wheel 11 are so chosen that the latter as well as the adjusting gear wheel 10 rotate somewhat faster than the main shaft 2. This adjustment of the clutch results in an adjustment of the blades of the air propeller in a definite sense. The opposite adjustment of the blades of the air propeller is obtained by displacing the piston 85 by means of its hydraulic control towards the right until said piston reaches the end of its stroke. Hereby the claws 83 of the gear wheel 82 come into engagement with the claws 80 of the gear wheel 81. The ratio of gearing between the gear wheel 75 arranged upon the main shaft 2 and the gear wheel 81 of the back gear is so chosen that the wheel 11 rotates slower than the main shaft 2. Hereby an adjustment of the propeller blades in an opposite sense is effected by way of the adjusting gear wheel 10.

The second back gear serving for the slow adjustment is constructed in the same manner as the first back gear already described except that the diameters of the corresponding gear wheels are chosen differently. The gear wheel 90 arranged upon the shaft 89 of the second back gear is connected to the gear wheel 77, mounted on the shaft 18 of the back gear, and thereby to the gear wheel 13. Moreover, the gear wheel 91 is connected to the gear wheel 81 and thereby to the gear wheel 75. Finally, the gear wheel 92 is connected to the gear wheel 82 and thereby to the gear wheel 11. The axial displacement of the gear wheel 92 provided with lateral coupling claws is effected by corresponding parts, as for the gear wheel 82, that is to say, by the piston 85' with the piston rod 86' and the cross rod 87'.

As mentioned already, the axial displacement of the wheels 82 and 92 effecting the coupling either for a high pitch or for a low pitch is obtained by hydraulic actuation of the pistons 85 and 85'. Hydraulic means have already been used in connection with variable pitch propellers. Hereby in most cases the difficulty is to overcome that the hydraulic means is to be supplied under pressure from a stationary portion of the aircraft into a revolving portion, for instance the hub. This difficulty does not exist with the construction according to the present invention, because the entire adjusting device is stationary so that the hydraulic means need be conducted through stationary pipes only which easily may be sealed.

As the two pistons 85 and 85' for shifting the two back gears are identical, the description of the hydraulic control of the piston 85 only will be sufficient. Leading into the cylinder space pro-

vided in the drawing at the right-hand side of the piston 85 is a conduit 101 which discharges into a cylinder in which the control slide 102 is provided. From the cylinder space at the left of the piston 85 a conduit 103 leads to the same cylinder of the control slide 102. In the position of the control slide 102 shown in the drawing the conduit 101 is by way of a passage 104 connected to a cylinder space in which the control slide 105 is provided. From this cylinder a further connection to a passage 106 is provided which allows the discharge of the hydraulic medium, for instance oil under pressure.

The conduit 103 is connected by way of the cylinder containing the control slide 102 to a passage 107 which leads into the cylinder of the control slide 105. In the position of the control slide 105 shown in the drawings, a connection between the passage 107 and the passage 108 representing the discharge of the oil under pressure is possible.

Into the cylinder of the control slide 105 discharges a passage 109 by which oil under pressure is supplied.

The control slide 102 is arbitrarily adjusted by hand, whereas the control slide 105 is actuated by the centrifugal governor 18. By means of the slide 102, therefore, either the back gear provided with the piston 85 and serving for the fast adjustment of the back gear provided with the piston 85' and serving for the slow adjustment may be rendered operative. The axial displacement of the clutch-gear wheels 82 and 92 respectively and thereby the adjustment of the blades of the air propeller to higher or lower pitch is effected in a manner known per se by the fact that the centrifugal governor controls the slide 105 and thereby allows the supply of oil under pressure either into the space provided adjacent the right-hand side or at the left-hand side of the piston 85 and 85' respectively.

The oil under pressure used for effecting the switching or shifting movements may be derived from any desired source, for instance also from the motor oil pump.

In the construction shown the shifting or switching of the gear is effected by a servo-motor, because thereby the centrifugal governor 18 is released from the forces necessary for effecting the shifting or switching movements and has to cause only the movement of the control slide 105. Of course, the shifting or switching could be effected without the use of the servo-motor also, that is to say, directly by the centrifugal governor.

All the above described modifications are characterized by a very simple construction of the hub of the air propeller and by a resistivity and a perfectly reliable construction of the elements which produce the power necessary for the adjustment, control, transform and transfer this power from the stationary adjusting device upon the hub and the feet of the propeller blades. The assembling and the exchange of the individual members may easily be effected and even most drastic alterations of the operating conditions, as for instance of the temperature, humidity of the air or the like have no effect whatever. As far as electric devices are employed, the use of slip rings and similar unreliable parts subjected to wear has been rendered superfluous.

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PUBLISHED

MAY 18, 1943.

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### VARIABLE PITCH AIR PROPELLER

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4 Sheets-Sheet 1

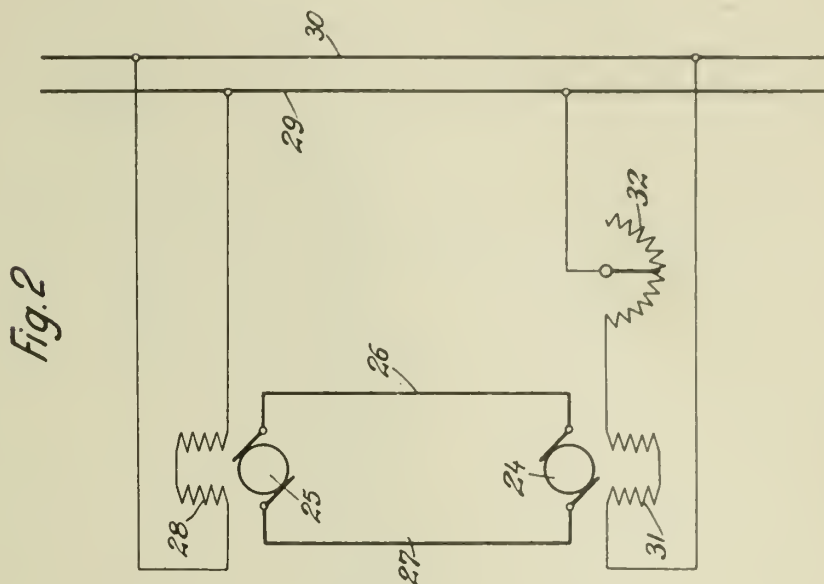


Fig. 2

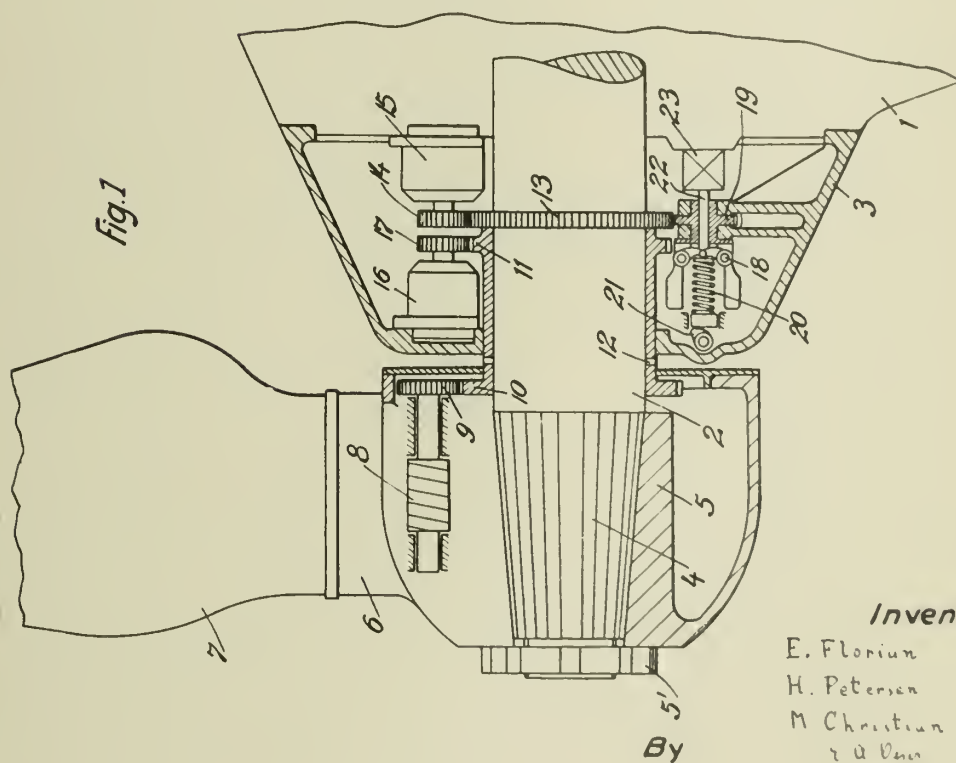


Fig. 1

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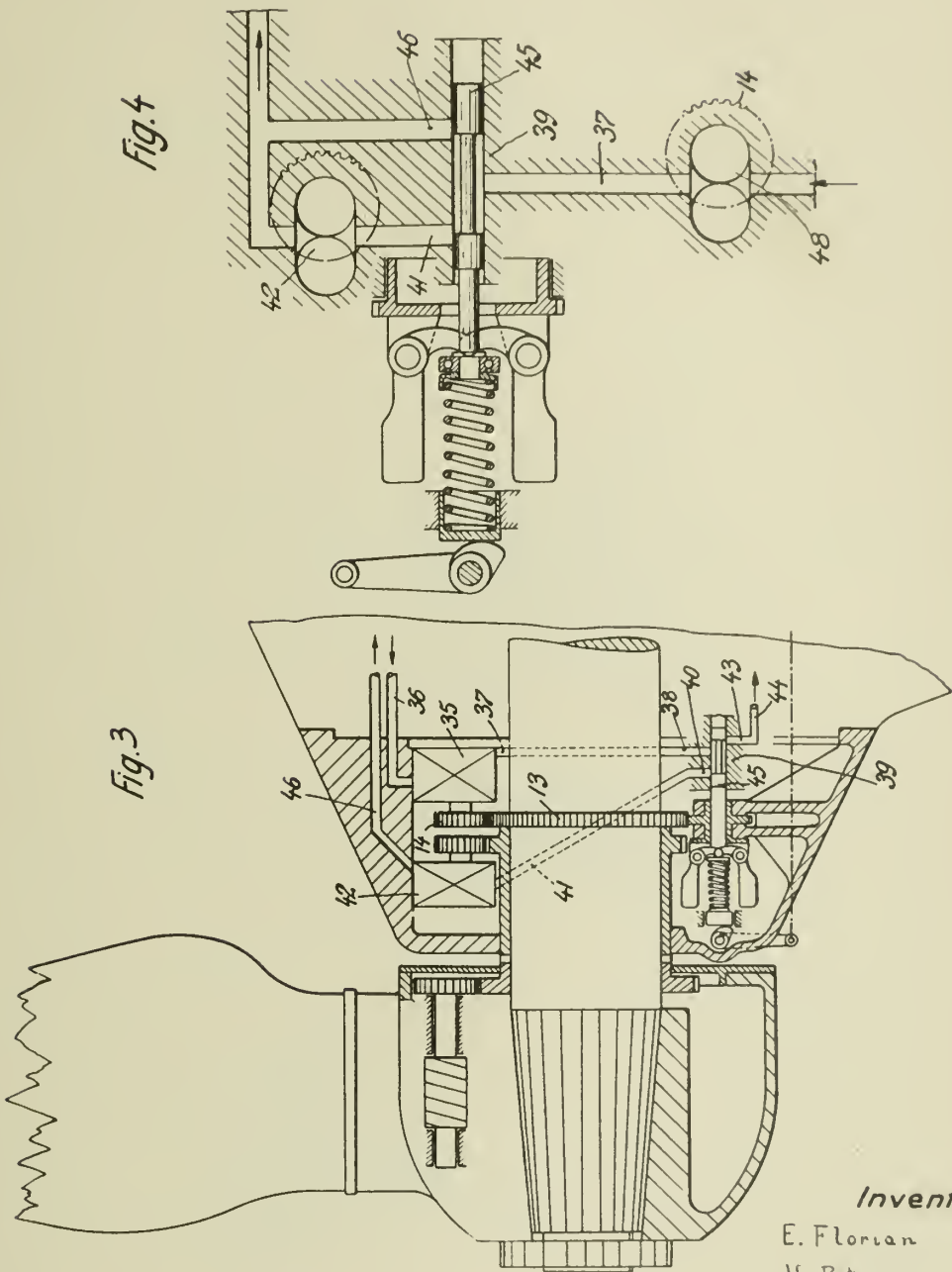
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VARIABLE PITCH AIR PROPELLER

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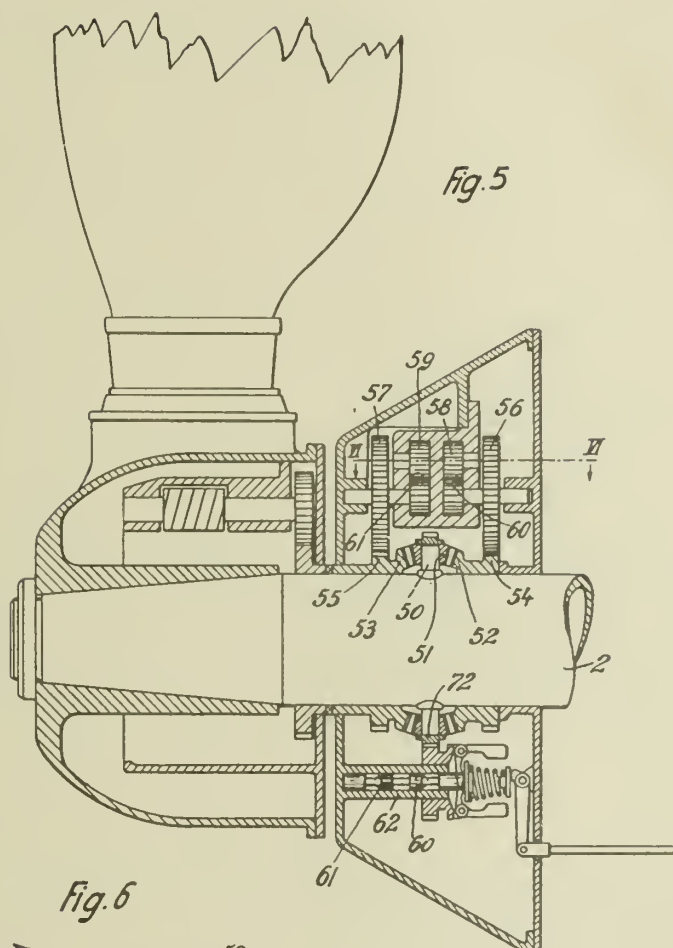
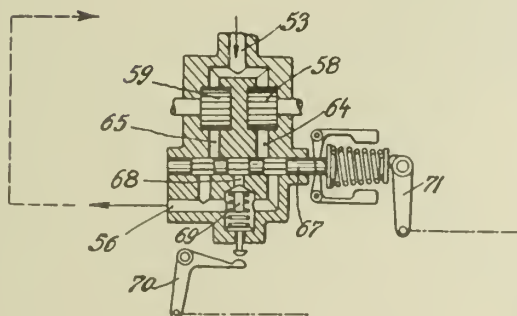


Fig. 6



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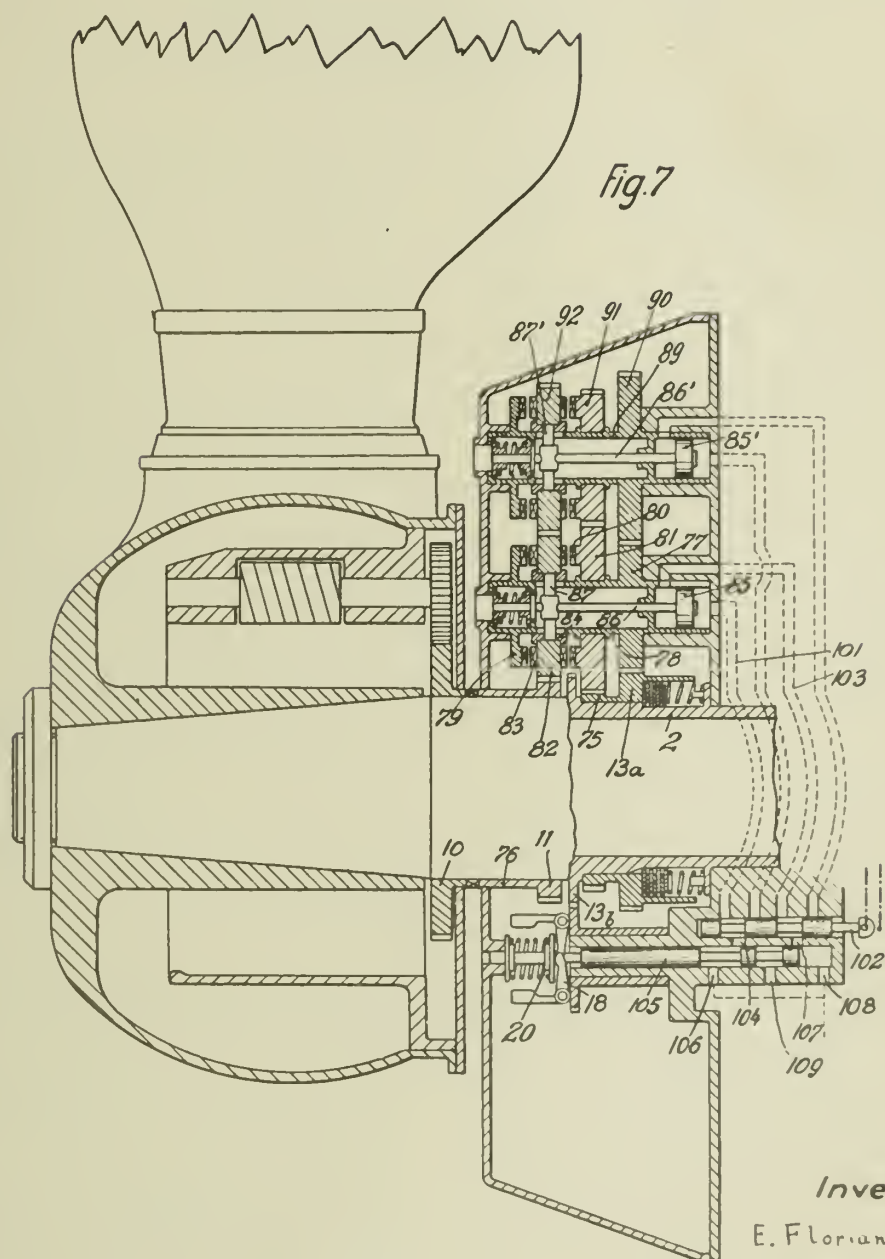
VARIABLE PITCH AIR PROPELLER

Filed July 12, 1940

Serial No.

345,132

4 Sheets-Sheet 4



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# ALIEN PROPERTY CUSTODIAN

## PROCESS FOR THE THERMAL TREATMENT OF CARBONACEOUS MATERIAL

Wilhelm Michael, Ludwigshafen-on-Rhine, Otto Goehre, Heidelberg, Gerhard Free and Wilhelm v. Fuener, Ludwigshafen-on-Rhine, and Wilhelm Schneider, Mannheim, Germany; vested in the Alien Property Custodian

No Drawing. Application filed July 13, 1940

The present invention relates to a process for the thermal treatment of carbonaceous material.

We have found that highly efficient catalysts for the thermal treatment of carbonaceous materials, more particularly for the splitting of these materials, are obtained by mixing moist mineral gels with a metal salt solution and heating the mixture, if desired after the addition of a precipitant.

The gels are prepared from the solution of these salts of the elements of the 3rd and 4th groups of the periodic system which are capable of forming gels, especially of silicon, titanium, zirconium, thorium, cerium or aluminium, by the addition of suitable precipitants, as for example acids or salts.

The catalyst may be prepared by mixing the gel, preferably a silica gel, precipitated from a silicate solution or a mixture of several gels with a solution of one or several metal salts, especially salts of the metals of the 2nd to the 8th groups of the periodic system, and more particularly of magnesium or the earth metals, of titanium, tin, zinc, and the metals of the 5th, 6th or the iron group and then heating the mixture in order to eliminate the whole or the bulk of the moisture. For this purpose the mixture may for example be evaporated to dryness, whereupon heating is preferably continued up to temperatures of 250° C, or even higher, say of the range of from 300 to 400° C, in order that the metal salts deposited on the gel are converted into other compounds.

The mixture of gel and metal salt solution may also be evaporated at about 100° C, filtered, prior to dryness washed, if desired, for removing the precipitant employed for the preparation of the gel, then dried and, if desired, heated up to a higher temperature.

The gel may also, before the addition of the metal salt solution, be freed from the precipitant and then further used in the manner described.

Catalysts of a high efficiency can also be obtained by adding a precipitant, for example ammonia, ammonium carbonate, ammonium sulphide or caustic alkali lyes, either while or after mixing the gel with the metal salt solution. The precipitant may also be added to the gel before the addition of the metal salt solution. It is not necessary to separate the gel from the aqueous liquid prior to adding the metal salt solution or the precipitant.

The catalysts may also be prepared by mixing of solutions of gel-forming substances with so-

lutions of one or more metal salts without practically any precipitation taking place and subsequently adding one or more precipitants to the mixture. The formation of a precipitate is avoided in known manner for example by the addition of acids, such as dilute hydrochloric acid. The precipitant should be capable of precipitating both the gel and the metal salt. For this reason it is sometimes necessary to use more than one precipitant. The precipitant may also be added in such manner that for example the agent promoting formation of the gel is first added and then the agent serving to precipitate the metal salt.

The preparation of the catalyst may also be carried out in the presence of bleaching earths or bauxite or similar substances.

The gel is filtered off from the solution along with the metal compound precipitated, washed for removing particularly the alkaline precipitant and dried. It may be advantageous to expose the catalyst to high temperatures if desired in the presence of reducing gases before its use, for example by slowly heating it from 450° to 800° C.

The gel and the metal salt solution are mixed in such a proportion that the catalyst contains from about 10 to 98 per cent, for instance from 60 to 90 per cent of the gel. For the cracking and destructive or refining hydrogenation processes such catalysts are very suitable as contain from about 10 to 75 per cent, preferably from 30 to 75 per cent of gel. When using for the preparation of such a catalyst silica as gel and alumina as gel or as the metallic component, if desired together with other gel-forming or metallic substances, the ratio of SiO<sub>2</sub> to Al<sub>2</sub>O<sub>3</sub> may be less than about 75 to 25.

The following table shows for example the constituents of catalysts suitable for the thermal treatment of carbonaceous material, prepared in the said manner, but the invention is not restricted to the use of these catalysts.

Si-Mg	-----	Si-Mg-Al
Si-Al	-----	Al-Mg
Si	-----	
Si-Mg	-----	} Together with one or more of the following metals: Zn, Sn, Ti, V, Cr, Mo, W, Fe, Ni and Co.
Si-Al	-----	
Si-Mg-Al	-----	
Al	-----	
Al-Mg	-----	

The catalyst may also be mixed with carbonaceous substances, as for example graphite or

lignite small coke, shaped and then heated to from about 500° to 600° C.

The catalyst thus obtained contains the metal compound in a state of fine distribution within the gel. If the gel is mixed with a metal compound previously precipitated, a catalyst is obtained having only a poor efficiency, even when the mixing is done while intensely stirring.

Another advantage in the catalyst prepared according to the present invention resides in the fact that its efficiency can be easily restored to the full initial value by a treatment, for example with oxidizing gases, at an elevated temperature.

This treatment may be carried out at high temperatures up to about 800° C whereas when regenerating siliceous catalysts not obtained by precipitation from solutions of gel-forming substances, for example natural bleaching earths, temperatures surpassing about 500° C must not be employed as otherwise the catalyst would be damaged. The maintenance of such a low temperature in regenerating the catalyst wherein exothermic reactions take place is only possible with a careful control of the temperature and of the oxygen content of the oxidizing gases used and is therefore very troublesome.

In the cracking and hydrogenation processes the formation of gaseous substances is considerably reduced by the use of the said catalysts if the metal or metal compounds are completely or partially dissolved out for instance with the aid of inorganic or organic acids. The resulting product is then freed from acid, preferably by washing, dried and brought into a suitable shape.

The efficiency of the catalyst may be still further increased by an addition of boric acid. The use of the latter type of catalyst results in a specially high output of a highly anti-knock benzene.

The boric acid may be added to the gel in a solid or liquid form either before or after the addition of the metal salt solution or the precipitant, or after the filtration, or before or during the heating.

The amount of boric acid added may vary within wide limits, the preferred amount being from 5 to 30 per cent calculated with reference to the dry mixture of gel and metal compound.

The catalysts claimed or mixtures thereof are especially adapted for use in splitting carbonaceous materials, such as mineral oils, tars, extraction products of solid carbonaceous materials, cracked products, destructive hydrogenation products of coal, tars, mineral oils or wood, or oils produced synthetically from carbon monoxide and hydrogen, as well as fractions of the said oils. The splitting is preferably carried out at temperatures of between about 300 and 700° C or more, at ordinary, reduced or increased pressure, for example at between 10 and 200 atmospheres, if desired in the presence of gases, such as hydrogen, steam, nitrogen or oxides of carbon.

The catalysts are also very suitable for the hydrogenation of the said substances particularly when working at pressures above 300 atmospheres, for instance 400 to 800 atmospheres. In this case preferably a catalyst is used containing silica and alumina and if desired in addition thereto metals as magnesium, iron, cobalt, nickel, tungsten, molybdenum, chromium, manganese, vanadium or uranium or their compounds in amounts from 0.5 to 25 per cent or more.

When using as initial materials for cracking or hydrogenation processes hydrocarbons very rich in hydrogen for instance hydrocarbons obtained

by the reaction of carbon monoxide with hydrogen, pure paraffin-basic petroleum or hydrocarbons rich in hydrogen obtained by pressure hydrogenation and/or with the aid of selective solvents and which contain at least 15 grams of hydrogen for each 100 grams of carbon, or fractions of the said substances, not only is a good yield of benzene obtained but there is only a relatively small formation of gas if multi-component catalysts are used which have been prepared in the said manner by mixing gel substances with a magnesium salt solution. A catalyst containing mainly magnesia and silicic acid and preferably also a small amount of zinc is especially suitable.

Other thermal treatments of carbonaceous substances for which the said catalysts are suitable are the polymerization, alkylation, isomerizing, desulphurizing and refining of hydrocarbon oils.

The following Examples will further illustrate how the said invention may be carried out in practice but the invention is not restricted to these Examples. The parts are by weight unless otherwise stated.

#### Example 1

100 grams of sodium silicate containing 28.1 grams of  $\text{SiO}_2$  are diluted with 900 grams of water and a solution of 22.5 grams of ammonium chloride in 150 cubic centimetres of water is added to the mixture while stirring. The silica gel thus precipitated is filtered off, washed, made up into paste with 28 grams of aluminium nitrate while still in a moist condition, dried on the water bath and then heated until nitrous gases no longer escape.

If a middle oil derived from a German mineral oil be passed over the said catalyst at 460° C under atmospheric pressure, almost half of the oil is obtained as a highly anti-knock benzene. Only a few per cent of the initial material are gasified or converted into condensation products. The efficiency of the catalyst, when diminished after prolonged use, may be restored by heating the catalyst with gases containing oxygen.

#### Example 2

1 part of sodium silicate containing 0.28 part of silicic acid is diluted with 9 parts of water and the silicic acid is precipitated by means of a solution of 0.23 part of ammonium chloride and 1.5 parts of water. There are then added, while stirring, a solution of 0.28 part of aluminium nitrate ( $9\text{H}_2\text{O}$ ) and 1.5 parts of water, and concentrated ammonia water until the reaction has turned alkaline. The whole is then boiled, filtered and the precipitate washed with hot water and dried at 200° C.

The dry gel is pea-sized and entered into a reaction vessel through which the vapors of a middle oil derived from a German mineral oil and having a boiling point range of from 200° to 350° C are passed at a temperature of 460° C and under atmospheric pressure. The output is equal to that of Example 1.

#### Example 3

500 cubic centimetres of commercial water-glass solution (2.1 gram molecules of  $\text{SiO}_2$ ) are diluted with water to 3 litres and 140 cubic centimetres of concentrated hydrochloric acid are added while stirring vigorously (pH value of the mixture below 4). A solution of 687 grams of  $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$  is then introduced, no precipi-

tation taking place. By neutralization with ammonia, a silicic acid gel containing aluminium is then precipitated, washed well, dried, shaped and heated in a current of air at from 400° to 450° C.

Over a catalyst prepared in the said manner there are led for 2 hours vapors of a petroleum middle oil at a temperature of 460° C, the throughput being 0.5 litre of oil per litre of catalyst per hour. A product is obtained consisting to the extent of 40 per cent of liquid fractions boiling up to 200° C which have very good non-knocking properties.

#### Example 4

100 grams of sodium silicate containing 28.1 grams of  $\text{SiO}_2$  are diluted with 900 grams of water and mixed with a solution of 22.5 grams of ammonium chloride and 150 cubic centimetres of water while stirring.

A solution of 28.4 grams of aluminium nitrate ( $9\text{H}_2\text{O}$ ) and 150 cubic centimetres of water, and ammonia are added to this mixture, while stirring, until an alkaline reaction is obtained.

The whole is boiled up, filtered while still hot and washed with hot water. The filtrate while still moist is mixed with 2 grams of boric acid, made up into homogeneous paste while stirring and then heated at 250° C for about 10 hours.

If a middle oil obtained from a German mineral oil be passed over this catalyst at 460° C and under atmospheric pressure, the output amounts to about 50 kilograms of benzine for each 100 kilograms of middle oil, the said benzine having an octane value of 85.

#### Example 5

50 litres of sodium silicate solution having a specific gravity of 1.32 are diluted with water to about 300 litres and 14 litres of concentrated hydrochloric acid are slowly added while stirring. To the gel thus formed there is added while stirring a solution of 102 kilograms of crystallized magnesium chloride (containing six molecules of

water of crystallization) in 100 litres of water; precipitation is then effected with concentrated ammonia water and the whole heated to boiling. The precipitate formed is filtered off, washed out with hot water and dried at 120° C.

The dry gel is comminuted to the size of peas and there is led thereover at 460° C and at atmospheric pressure the vapor of a hydrocarbon mixture boiling at from about 200° to 330° C obtained by the reaction of carbon monoxide with hydrogen. By a single passage over the catalyst there are obtained about 20 per cent by weight of benzine (with reference to the hydrocarbon mixture used) and about 1.5 per cent by weight of gas mainly containing propane and butane, in addition to traces of hydrocarbons of lower molecular weight.

#### Example 6

To 500 cubic centimetres of sodium silicate solution having a specific gravity of 1.32 diluted with water to 3 litres are added 160 cubic centimetres of concentrated hydrochloric acid and then a solution of 2750 grams of  $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$  in 8 litres of water. To the mixture ammonia water is added until an alkaline reaction is obtained. The precipitate formed is separated by filtration, washed out with water, dried, shaped and heated to 150° C.

If this catalyst which contains 66 per cent of  $\text{Al}_2\text{O}_3$  and 34 per cent of  $\text{SiO}_2$  is used for cracking paraffin-basic middle oils at 460° C a product is obtained containing 30 per cent of benzine. The higher boiling constituents of the product are recycled to the reaction chamber. After one hour the catalyst is regenerated and again used for the same process.

This application has been divided out of application Ser. No. 222,144, filed July 30th, 1938.

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# ALIEN PROPERTY CUSTODIAN

## MAGNETIC SEPARATORS

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Application filed July 12, 1940

This invention relates to magnetic separators for ferrous materials mixed with non-magnetic materials, in which the mixed materials to be separated into ferrous material and non-magnetic material is caused to flow over a drum made of non-magnetic material which revolves around an inductor operative on a section of the drum periphery said section being located on one side of a vertical plane passing through the rotary axis of said drum.

In the operation, the non-magnetic material falls down from the drum in register with the vertical plane tangent to the drum section where the inductor is operative while the ferrous material is retained on the drum until it reaches the bottom end of said section and is collected separately at the point where it falls down from the drum.

In the separators of the above stated class the inductor includes rims of magnetic material arranged at the side of and concentric with each other and with said drum, and permanent magnet units having arc shape and each located intermediate two adjacent ones of said rims, and each of said units includes a set of magnets arranged adjacent to each other in the circumferential direction of the inductor with their magnetic axis extending in the direction of the common axis of said rims and units and their pole faces in contact with the cooperating inductor rims.

I have found that to secure an efficient action of the magnets which provide each of said arc-shaped magnet units said magnets must comply with certain requirements as to their size and configuration and that more particularly the ratio of the extent of each magnet in the direction of its magnetic axis to its size in a plane transverse to said direction must substantially be included within certain ranges.

More particularly I have found that satisfactory conditions are secured when said ratio is such as the extent of each magnet in the direction of its magnetic axis is equal to or larger than the square root of the area of the section of said magnet in a direction perpendicular to said axis.

In accordance with this invention each of the magnets providing an arc shaped magnet unit has such a size transverse to its magnetic axis as the square root of the area of the cross section of the magnet in a plane transverse to said magnetic axis is less than the extent said magnet is required to have in the direction of the magnetic axis that is in the direction of the axis of

the inductor rims to comply with structural and operative requirements.

The extent of each magnet in circumferential direction of the respective unit and the extent thereof in the direction of the radius of the unit may vary within certain ranges to comply with structural requirements and the extent of said magnets in the direction of their magnetic axis may be selected to comply with certain requirements.

It is only essential that the above stated ratio exists in each magnet between its several dimensions, said ratio making possible to secure the best efficiency in an inductor of the above stated class.

An embodiment of this invention is illustrated by way of example on the annexed drawing and

Fig. 1 is a central section made on line 1—1 of Fig. 2;

Fig. 2 is a fragmentary transverse section on line 2—2 of Fig. 1.

In the illustrated embodiment the inductor comprises a number of rims 1, 1', 1'' made of magnetic material which are arranged at the side of and concentric with each other, and permanent magnets 2, 2' are arranged in arc-shaped units between adjacent rims 1, 1', 1'' and along the periphery thereof, with their respective magnetic axes parallel with the common axis of said rims; the rims 1, 1', 1'' and the magnets 2, 2' are interconnected by bolts 3 of non-magnetic material which extend through holes provided in the rims 1, 1', 1'' and intermediate said magnets 2. Each rim 1, 1', 1'' includes a web 1<sup>a</sup> and a flange 1<sup>b</sup> as illustrated.

Each arc-shaped magnet unit 2, 2' is located along a semicircular section of said rims 1, 1', 1'' which extends from one to the opposite end of the diameter of said rims which lies vertical when the separator is in operative position, and an outer drum shown at 4 encircles the inductor provided in the described manner and is caused to revolute thereabout.

The magnets 2, 2' are arranged in each unit with their pole faces of similar sign adjacent to and contacting with one and the same rim of the pair of adjacent rims 1, 1', 1'' and the two adjacent units have their pole faces of same sign opposite each other; in other words, as illustrated in Fig. 1, all the magnets of the unit 2 located intermediate the rims 1 and 1' have say their N pole faces in contact with the rim 1' and their S pole faces in contact with the rim 1, while the magnets of the unit 2' have their N

pole faces in contact with the rim 1' and their S pole faces in contact with the rim 1''.

Accordingly the magnetic circuit of each magnet unit 2, 2' has a minimum extent because it closes in the gap intermediate the adjacent rims 1, 1', 1'' of each pair; the magnetic flux on the separator drum 4 is thus availed of in the best possible manner.

In accordance with this invention each magnet 2, 2' has such a size as the square root of the

area of its cross section transverse to the magnetic axis thereof that is of its face in view in Fig. 2 is equal to or less than its extent 1 (Fig. 1) in the direction of said magnetic axis.

In the above stated conditions each magnet unit generates a magnetic action which is larger than that obtainable by means of magnets whose sizes do not comply with the above stated rule, other conditions being equal.

FELICE ENRICO VEGLIO.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

F. E. VEGLIO

MAGNETIC SEPARATORS

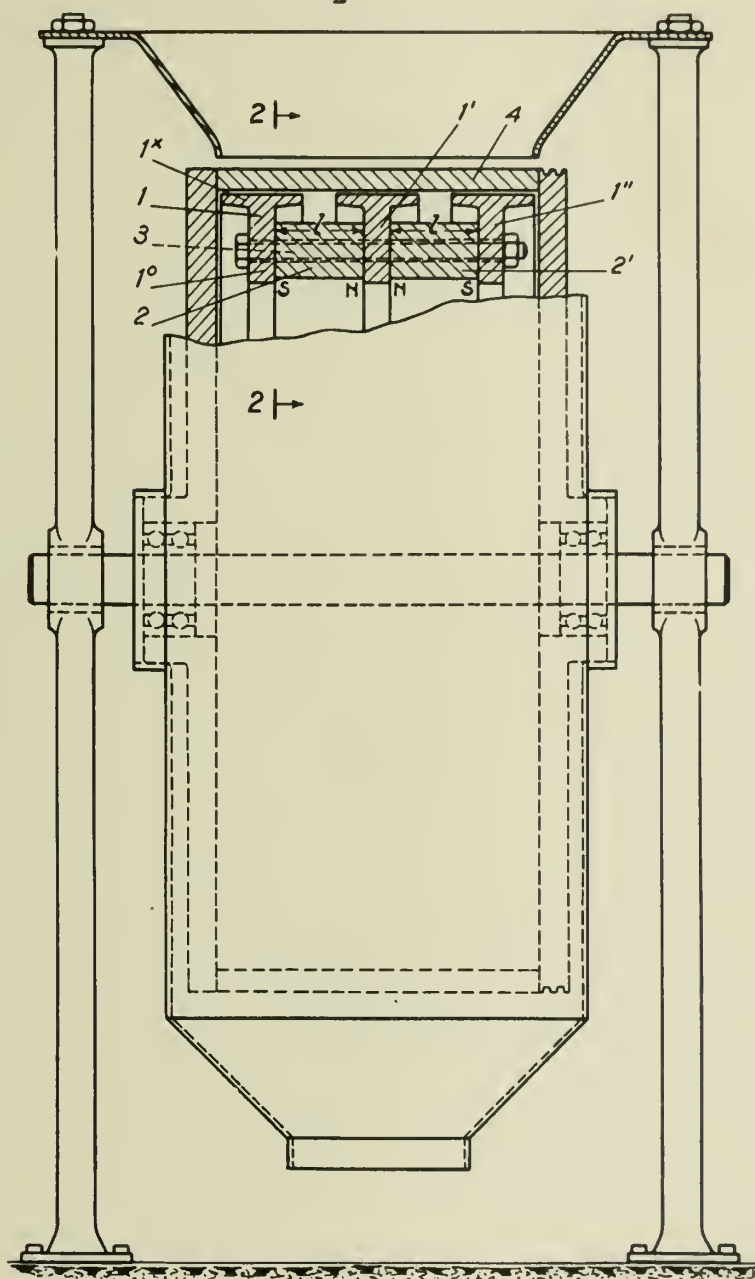
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2 Sheets-Sheet 1

Fig. 1



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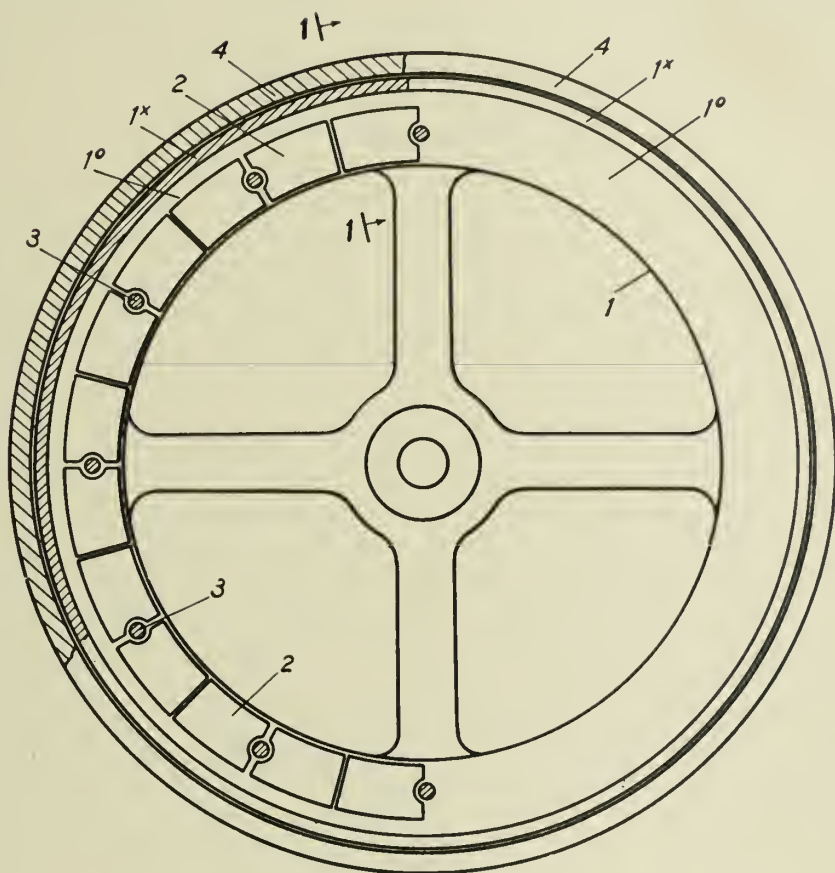
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2 Sheets-Sheet 2

Fig. 2



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# ALIEN PROPERTY CUSTODIAN

## METHOD OF MANUFACTURING FINELY GRADED SPIRAL ELECTRIC RESISTORS

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Application filed July 17, 1940

This invention relates to a method of manufacturing finely graded spiral electric resistors.

Finely graded spiral electric resistors which are, for instance, employed in flight control instruments in which a magnetic needle or the like of a small directional force slides on the spiral designed in the form of a potentiometer have hitherto been made of wire which was given a diameter of only a few hundredths of a millimeter in order to attain accurate indications and an accurate control. Notwithstanding this small cross-section of wire such resistors are not sufficiently finely graded for certain purposes.

Methods are further known in which an insulating body is first provided with a resistant compound and in which body a spiral is then milled. These methods present the drawback in that they are complicated and therefore expensive, since during the milling process the spirals are liable to be easily destroyed.

The above-mentioned drawbacks are avoided by the method according to the invention which consists in providing an insulating body with a fine thread, coating said body with a layer of conducting material and then in reducing the thickness of the conductive layer at least to the original diameter of the insulating body.

In the accompanying drawings is shown an embodiment of the invention in diagrammatic form.

Fig. 1 shows an enlarged view of a resistor made according to the invention and in which are illustrated the steps of the novel method.

K denotes a cylindric insulating body which may be made of Bakelite. O designates the piece of the cylinder before being machined according to the method of the invention. Section I shows the insulating body provided with a thread. Section II shows the body partly in section coated with a layer of insulating material. Section III shows the finished resistor also partly in section after the conducting layer has been reduced to the outer diameter of the insulating body.

The conducting layer S may be applied to the insulating body by any suitable method, for instance, by the known Schop spraying method.

In Fig. 2 is shown a potentiometer P made according to the novel method which is connected to a cross coil instrument J. A magnetic needle M passes over the potentiometer P and its deflections are transmitted to a scale in a known manner by the instrument J provided with a pointer Z.

GERALD KLEIN.



PUBLISHED

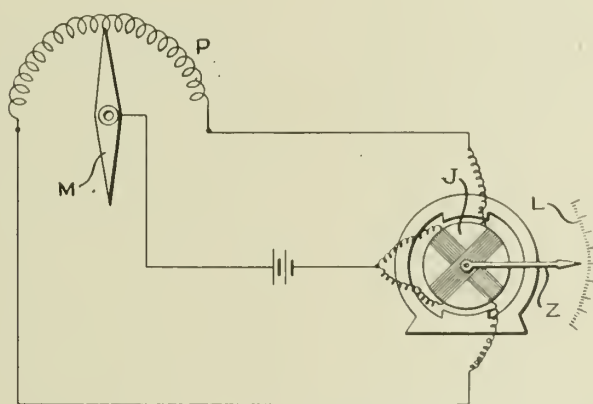
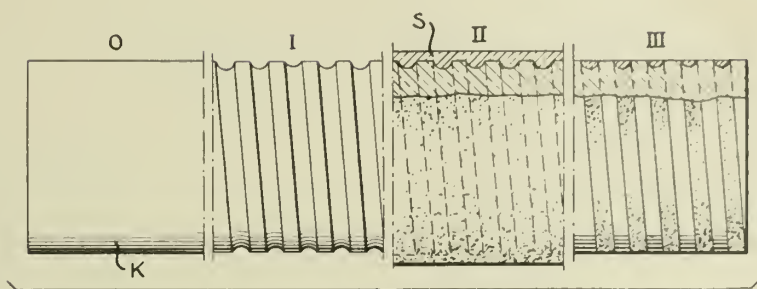
MAY 18, 1943.

BY A. P. C.

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METHOD OF MANUFACTURING FINELY GRADED  
SPIRAL ELECTRIC RESISTORS  
Filed July 17, 1940

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346,060



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ALIEN PROPERTY CUSTODIAN

CLOTHS FOR ELECTROCHEMICAL  
DIAPHRAGMS

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Augsburg, Germany; vested in the Alien Prop-  
erty Custodian

No Drawing. Application filed July 22, 1940

The present invention relates to cloths for electrochemical diaphragms.

Various processes are already known for using filter cloths which consist of after-chlorinated polyvinyl chloride as diaphragms for electrochemical purposes. It has, however, been found that in the presence of a strongly acid electrolyte of an oxidizing action the tissue is not sufficiently tight so that even after shrinkage of the fiber in hot water of 90° C the diffusion between the anode liquid and the cathode liquid is not prevented.

Now we have found, and this being surprising, that felt or tissue of fibers from after-chlorinated polyvinyl chloride possess the desired impermeability which have been impregnated with silicic acid and at least one water-insoluble inorganic salt. Insoluble salts of calcium and barium are particularly suitable for that purpose. The impregnation may, for instance, be produced by saturating the felt or tissue with aqueous solutions of salts of silicic acid and with metal salts, for instance barium salts and after-treating them with dilute sulfuric acid.

The after-chlorinated polyvinyl chloride is for instance obtained according to the process described in U. S. Patent No. 1,982,765.

The following examples serve to illustrate the invention, but they are not intended to limit it thereto, the parts being by weight:

(1) After-chlorinated polyvinyl chloride (for instance felt 300/2) is placed for 2 minutes into hot water of 90° C. After drying the shrinked

cloth is coated with an intimate mixture of 2 parts of barium sulfate and 1 part of waterglass (commercial) and allowed to dry in the open air. The cloth is then treated with sulfuric acid of about 10 per cent strength and again dried in the open air; the diaphragm is then ready for use.

(2) After-chlorinated polyvinyl chloride (for instance felt 300/2) is placed for 2 minutes into hot water of 90° C. The shrinked cloth is impregnated with a barium chloride solution which has been saturated in the hot condition. The cloth is then allowed to drop off and treated with dilute sulfuric acid for causing the barium sulfate to precipitate. After drying the cloth is soaked with waterglass and the silicic acid is set free by means of dilute sulfuric acid. After having been dried in the open air the diaphragm is ready for use.

(3) After-chlorinated polyvinyl chloride (for instance felt 300/2) is placed for 2 minutes into hot water of 90° C. The shrinked cloth is impregnated with calcium chloride solution and calcium phosphate is precipitated on the fiber by means of tri-sodium phosphate. The cloth is washed for a short time with water for removing the sodium chloride; it is then soaked with commercial waterglass and the silicic acid is set free with phosphoric acid. After having washed it with water and subsequently dried in the open air the diaphragm is ready for use.

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# ALIEN PROPERTY CUSTODIAN

## ELECTRIC MOTOR CONTROL

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Application filed July 25, 1940

This invention relates to electric motors, and more particularly to remote control means for electric motors.

One of the objects of the present invention is to provide novel means which are light in weight and especially adapted for use in aircraft for governing an electric motor at a point remote from the motor.

Another object of the invention is to provide novel means of the above character which are highly compact.

A further object is to provide easily accessible means for controlling electric motors which are mounted in inaccessible locations in vehicles such as aircraft.

The above and further objects and novel features will more fully appear from the following detailed description when the latter is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for purposes of illustration only and are not intended as a definition of the limits of the invention, reference for this latter purpose being had to the appended claims.

In the drawings, wherein like reference characters refer to like parts throughout the several views,

Fig. 1 is a schematic illustration of one embodiment of the invention;

Fig. 2 is a side elevation partly in section of another embodiment of the invention;

Fig. 3 is a side view with parts broken away of the embodiment of Fig. 2; and

Fig. 4 is a bottom plan view of a portion of the embodiment of Fig. 2.

The forms of the invention illustrated in the accompanying drawings, by way of example, comprise remote control means for a motor which can be employed in a vehicle such as an aircraft. The remote control means are constituted by a plurality of switches which are arranged in a predetermined manner relative to a contact moving member which is operatively connected to said motor and which is adapted for tripping or governing each switch. Electrically connected to all of said switches is a primary or control contact arm which, for example, is manually operable and can engage each of a plurality of control stage contacts, each of the latter being electrically connected to a corresponding switch. The electric motor is adapted for being controlled in response to a current flowing in any circuit formed by the control contact arm, a stage, a switch and suitable means for interconnecting the switch and arm. The motor will be energized

until the circuit is broken by the first mentioned contact moving member engaging a predetermined switch.

In the diagrammatic illustration of the invention shown in Fig. 1, a master or control transmitter A is operatively connected in a manner to appear later to a remotely controlled receiver apparatus B, which in turn is operatively connected to a device C which it is desired ultimately to control remotely. The control transmitter A is constituted by a control contact arm 10 which, for example, is manually operable and adapted for contacting any one of a plurality of contacts, such as contact elements or stages 11 to 16, inclusive. The contact stages are respectively connected electrically to suitable switch members 17 to 22, inclusive, upon the receiver apparatus B. Each of the switches 17 to 22 is constituted by a movable contact arm which is adapted to engage a stationary member and to remain in electrical contact with the stationary member until the movable arm is moved from a normal or initial position. As shown in Fig. 1, the movable elements of the switches 17 to 22 are constituted by elements 23 to 28. Members 23 to 28 respectively engage stationary arms 29 to 34, inclusive. The switches 17 to 22 are mounted in a predetermined relationship adjacent a repeater contact arm 35 which is operatively connected to electric motor 36 by means of a shaft 37. Preferably interposed in the operative interconnection between motor and arm 35 is a reduction gear 38. Each of the above mentioned switches is adapted for being controlled by the contact arm 35. The members 29 to 34, inclusive, of the switches are electrically connected by means of a common conductor 39 to the control contact arm 10 through a suitable source of electric energy 40.

In order that the electric motor 35 be controlled in response to a current flowing in any circuit formed by the control contact arm 10, a stage which it engages, a switch which is electrically connected to the stage and said conductor 30, it is preferable to interpose the electric motor in the conductor in such a manner that the energy from source 40 actuates the motor. The motor 36 in the embodiment shown is of the shunt variety and is provided with brushes 41 and 42 which are connected in the lead 39 in a conventional manner. Across the brushes 41 and 42 is a conductor 43 in which there is connected a solenoid 44 which governs in a well-known manner a brake member 45. The latter by suitable means (not shown) is adapted for frictionally engaging a portion of the motor to

prevent rotation thereof when the motor is deenergized. Operatively connected to the shaft 37 is a contact arm 46 comprising a portion of the above mentioned member C which is adapted for engaging any one of a plurality of contacts 47 to 52, inclusive. The number of contacts upon the member C corresponds to the number of control stages of the control transmitter A.

In operation, in order to position the arm 46 in such a manner that it will engage, for example, the contact 48 so as to create or to release a predetermined control force, the contact arm 10 of the transmitter is placed upon the stage 15. Assuming that the switch 21 is closed at this time, a complete electric circuit will be formed between the energy source 40, the arm 10, the switch 21, and the portion of lead 39 between said switch and the motor, and the portion of lead 39 between the motor and the energy source. The motor 36 is thus energized and angularly shifts the repeater contact arm 35 to such a position that the movable element 27 of switch 21 is disengaged from member 33. Consequently, the circuit is broken and the motor 36 is deenergized. During the period that the latter was energized, the solenoid 44 lifted the brake member 45 out of engagement with a movable portion of the motor to allow a free rotation thereof. However, when the motor is deenergized, the brake member 45 immediately frictionally engages the rotor of the motor and arrests rotation of the shaft 37. When the repeater contact arm 35 has moved a sufficient amount to open the switch 21, the contact arm 46 will have moved to the desired position and will engage the contact 48 as shown in the figure.

In the form shown in Fig. 2, a motor 53 which is analogous to motor 36 is mounted upon a suitable support member 54 and is provided with a rotor shaft 55. The latter is surrounded by a solenoid coil 56 which controls an axially shiftable brake 57. Members 56 and 57 are respectively analogous to the solenoid 44 and the brake member 45. Disc 57 is urged by means of a spring 57a towards a disc 55a which is fixedly attached to shaft 55 and provided with a suitable counterbalance portion (not shown) in order to counteract the vibrations which would otherwise be produced by a crank member to be described later.

The support member 54 is provided with cylindrical portion 54a, preferably integral therewith, which is concentric with the shaft 55 and upon which is rotatably mounted a sleeve member 58. A portion of member 58 telescopically engages cylindrical portion 54a and is retained rotatably thereupon, for example, by suitable ball bearings 59, which are adapted for movement within a ball race upon the inner surface of member 54a, and also in a ball race upon an outer surface of member 58. Upon the latter are mounted repeater contact arms which are analogous to member 35 of Fig. 1, and which are adapted for engaging contact elements or switches in a manner to appear later.

The operative interconnection between the angularly shiftable member 58 and the motor shaft 55 is constituted by an epicyclic train having two sun gears 60 and 61, which are respectively constituted by inner toothed surfaces of a portion of the member 54a, and a portion of the member 58. A crank member 62 is attached to shaft 55 and adapted for rotation therewith substantially centrally of said toothed surfaces. Upon the crank member are mounted planetary gears 63

and 64 which are adapted for engaging respectively the toothed sun gears 60 and 61.

In the diagrammatically illustrated form of Fig. 1, the repeater contact arm 35 is able to open a particular switch only when moving in one direction, for example, in a counterclockwise direction. It is desirable, of course, that this arm and the switches be so adapted that the arm can govern the switches when moving both in a clockwise and counterclockwise direction. This is accomplished in the embodiment of Figs. 2 to 4 by employing repeater contact arms 65 and 66 which are provided with insulated cam surfaces 65a, 66a, respectively. The latter are adapted for engaging the extremities of switch elements and for moving same in such a manner that the particular switch is opened regardless of the direction from which the cam surface approached the switch. Two repeater contact arms instead of one as in Fig. 1 are used for a purpose to appear later. Each repeater contact arm, in the form shown in Figs. 2 to 4, is constituted by a member in the shape of an angle bar with one face thereof secured by suitable screws 67 to a flange upon the sleeve member 58 whereby the remaining face of the angle bar extends parallel to the axis of the motor 53 and to the axis of member 54a. Cam surfaces 65a, 66a are mounted upon the latter face of members 65 and 66. The angular position of each repeater contact arm can be adjusted, for example, by loosening screws 67 and shifting the arm to a desired position.

As illustrated in Fig. 4, the motor 53 is supported by two opposed arms 54b of the member 54. Each arm 54b occupies approximately 90° of the space about the motor, thereby leaving two opposed angular slots 68 and 69, each of about 90° in angular extent, formed between member 54 and an outer housing 53a. Consequently, the switch members which are employed in this embodiment must extend through said slots and are restricted to being distributed over 180° instead of over 360°. Eight switch members are employed with this embodiment. If 360° were available over which they could be distributed, the angular interval between adjacent switches would be 45° provided a uniform interval is desired. A single repeater contact arm would be effective to engage a switch after each 45° of motion. However, since 360° is not available and since it is desirable that repeater contact means open a switch at the termination of substantially uniform intervals of angular motion, a novel disposition of switch members and repeater contact arms must be resorted to. The eight switches are provided with fingers 70 to 77, respectively, each of which is adapted for engagement by a repeater contact arm.

The manner of mounting each switch finger is illustrated by the mounting of finger 70. The latter comprises an elongated member having a rounded face at the lower extremity thereof for engagement with a cam of a contact arm, and a pivot or hinge at the opposite extremity which enables it to shift angularly about an axis which is tangent to the member upon which the pivot is mounted, that is, upon member 54.

Fingers 70 to 73 are mounted at uniform intervals in slot 68 and normally engage a bead or segment 78 which comprises a common conductor member and is analogous to common conductor 39 (Fig. 1) between the switches 17 to 22 and the motor 36. Fingers 74 and 77 are mounted in slot 69 and normally engage a common conductor 79

which is connected by suitable means (not shown) to member 78.

If a single repeater contact arm were affixed to sleeve 58 and adapted for actuating the switches 70 to 77 one at a time, it is seen that the motor 53, the sleeve and hence any device operatively connected thereto would be controllable by a suitable control transmitter analogous to transmitter A, without uniform angular intervals occurring between all the openings of the switches. Consequently, in order that the switches be opened at uniform intervals, two contact arms are provided, one of which can engage one group of fingers and the other of which can engage another group. The factor which determines which finger engages which contact arms is the length of the finger and the arms. If there are two contact arms as here shown (Fig. 4), then one group of fingers will be of one length and the remaining group of a different length. Therefore, there is a repeater contact arm, such as 65 (Fig. 2) which is long and adapted for reaching and engaging the shorter fingers, and there is a short contact arm as 66 which engages only the longer fingers. Of course, means must be provided for preventing the longer of the two contact arms from tripping not only the short fingers but also the long ones. This is accomplished, in the form shown (Fig. 4), by disposing the lower extremity of the longer fingers at a slightly greater radial distance from the axis of rotation of the contact arms than the shorter fingers. The radial distance of the cam face of each contact arm is coordinated to that of the finger group it is to engage. Consequently, the longer contact arm 66 will be unable to reach radially the longer fingers.

In the embodiment shown, fingers 70, 72, 74 and 76 constitute the longer group and fingers 71, 73, 75 and 77 the shorter group. By mounting the repeater contact arm 65, for example, at approximately 110° or 115° from arm 66, a substantial uniformity of angular interval between all switch openings can be obtained. By changing the angular spacing between the two arms 65 and 66, this angular interval between the openings of the switches can be governed.

A tumbler or tilting switch 80 (Fig. 2) is mounted upon the housing of motor 53 and is adapted for reversing said motor, for example, in the event that the remotely controlled unit C is not able to be rotated through 360°. The reversing is accomplished preferably by means of a radially extending pin 81 which is mounted, for example, beneath the contact element 66 and adapted for angular movement therewith. Switch 80 is actuable by a suitable switch arm 82 which depends therefrom into the angular path of the pin 81.

The rotatable sleeve 58, as shown in Figs. 2 and 4, is provided at the lower edge thereof with a plurality of recesses 83. Into these recesses a suitable coupling member 84 fits and is thus adapted for rotation with member 58. Centrally disposed on the coupling member 84 is a shaft 85 which is operatively connected to an arm analogous to the above mentioned contact arm 46 of the remotely controlled unit C. In order that a predetermined angular relation between

the member 58 and such a contact arm may be maintained, it is preferable that the recesses 83 be different one from the other such that the coupling 84 is adapted for engaging the member 58 when the two members are in only one angular relationship.

From a plurality of terminal arms 86 which are mounted upon a suitably insulated terminal bar 87, electrical conductors (not shown) lead to the various fingers of the repeater contact system and to the contact segments above described.

The operation of the embodiment is substantially analogous to the operation of the embodiment of Fig. 1, with the exception that the contact members 65 and 66 are adapted for lifting the contact fingers from the contact segments when the motor is in either clockwise or counterclockwise rotation.

Arms 86 are provided with resilient lower extremities 86a which are engaged by corresponding terminal members 88. The latter press firmly against the arms in electric contact therewith. When changing or removing the motor and terminal bar, it is thus unnecessary to connect and disconnect each individual lead by the usual method of loosening screws and disentangling wires therefrom.

Suitable clamp means are provided for holding the outer housing 53a to the remainder of the device comprising a yoke 89 pivoted at 90 upon 53a. Fingers 89a of the yoke engage arms 91 which are fixed to shoulders 92, the latter being integral with a base plate 93 of the support member 54. In order to prevent angular shifting of housing 53a, a slot 94 in the lower edge thereof engages a projection of the base plate 93.

In operation, a transmitter contact arm (not shown), analogous to arm 10, which is connected to the embodiment of Figs. 2 to 4 is moved to a desired transmitter stage. The motor is thus energized, disc 57 is moved away from disc 55a against the force of spring 57a, thus releasing the motor and enabling the latter freely to rotate and to shift contact arms 65 and 66 angularly until the proper finger, for example, finger 70 (Fig. 3), is lifted away from the segment 74. Immediately the motor 53 is deenergized, the disc 57 is released, disc 55a is gripped thereby, and the motor is suddenly arrested in rotation.

There is thus provided novel means for remotely controlling an electric motor and a suitable device operatively connected to said motor. The novel device is compact, light in weight, and especially adapted for use aboard vehicles such as aircraft.

Although only two embodiments of the present invention have been illustrated and described in detail, it is to be expressly understood that the invention is not limited thereto. For example, a greater number of contact fingers or switch members can be employed together with a larger number of contact arms, such as 65 or 66. Various changes in the design and arrangement of the parts can be made without departing from the spirit and scope of the invention as the same will now be understood by those skilled in the art.

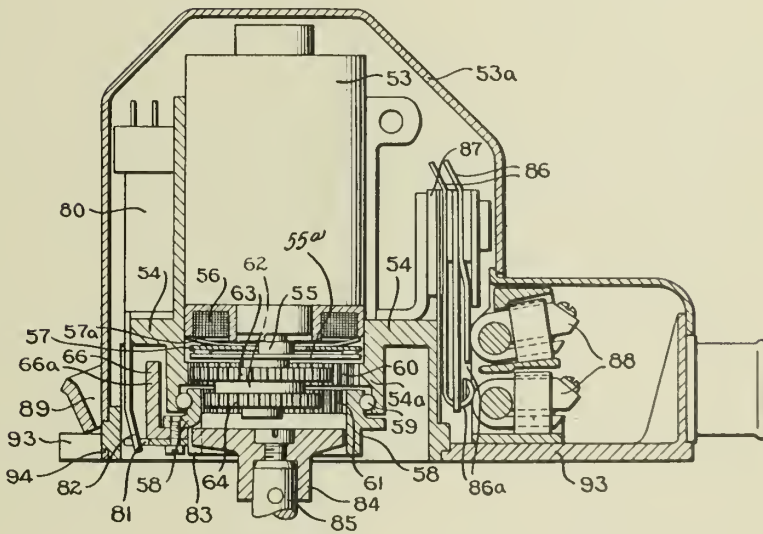
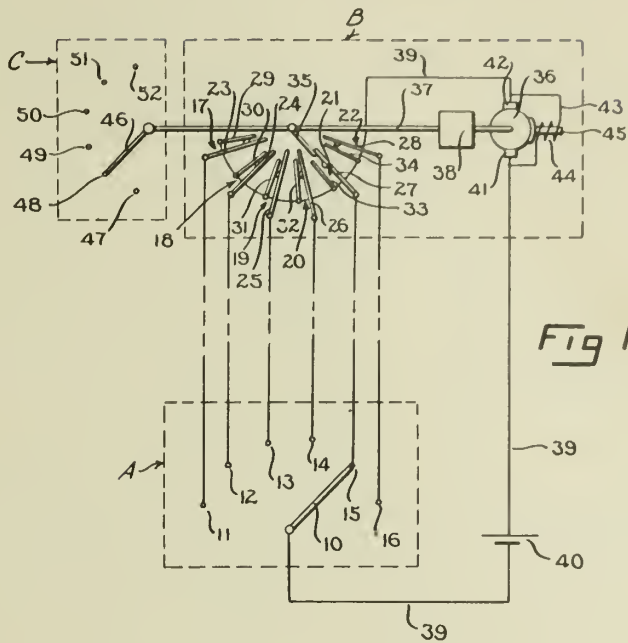
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Filed July 25, 1940

2 Sheets-Sheet 1



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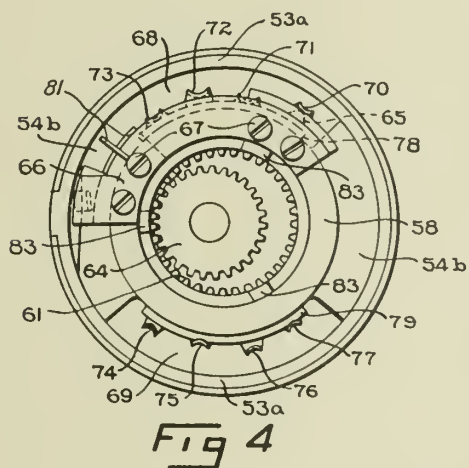
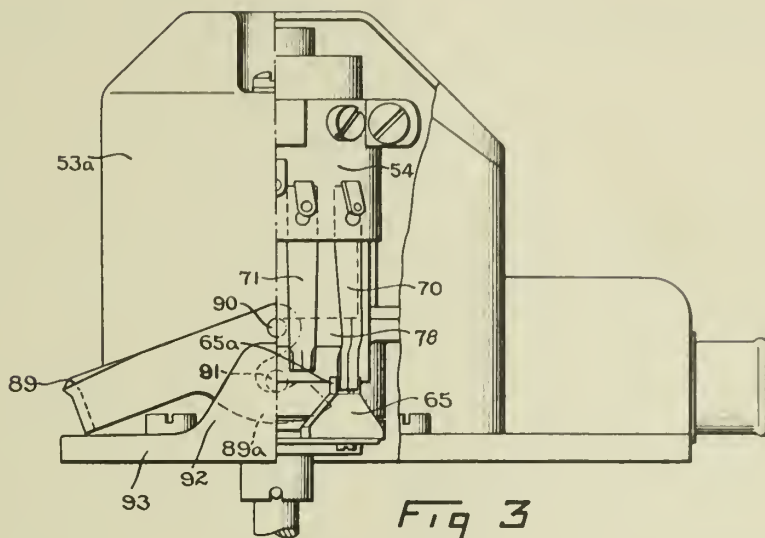
ELECTRIC MOTOR CONTROL

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2 Sheets-Sheet 2



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# ALIEN PROPERTY CUSTODIAN

## MAGNETIC FLUX DISTRIBUTORS

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Application filed July 24, 1940

It is known that laminated members consisting of ferromagnetic sheets are used in electromagnetic apparatus and particularly in ignition magnetoes for internal combustion engines to convey or distribute a variable magnetic flux; in such members it is essential to avoid the formation of short-circuit paths causing large losses by effect of eddy currents.

This invention is directed to provide members of said class in which losses by eddy currents are avoided and satisfactory conditions of operation are secured in respect of both the conveyance of magnetic flux and the machining of the parts.

This invention includes laminated members in which connecting members which assemble the sheets providing said members and extend transverse to said sheets, are located substantially in one and the same plane parallel with the path of the magnetic flux in said member.

On the other hand the laminated members embodied in the device and whose connecting members are in conditions to provide short-circuit paths extending through several members, are separated from each other by gaps intersecting said paths.

This invention further includes the provision of flux distributors by means of members built up in accordance with this invention which are arranged to provide sections arranged radially and longitudinally with respect to the distributor axis respectively, in satisfactory conditions both as to the provision of the distributor and the distribution and conveyance of the magnetic flux.

An embodiment of this invention in a flux distributor for an ignition magneto of an internal combustion engine is shown by way of example on the annexed drawing in which:

Fig. 1 is a fragmentary longitudinal section of an ignition magneto provided with a flux distributor in accordance with this invention said section being made on the line I—I of Fig. 2;

Fig. 2 is a transverse section thereof on line 2—2 of Fig. 1 with parts removed, and illustrates one of the distributor star members and the transverse section of the distributor core.

In the illustrated embodiment the magneto includes a shaft 1 journaled in bearings 2 and 3 fast in the magneto casing 4 in which a stationary ring-shaped magnet 5 and a winding including a primary section 6 and a secondary section 7 are located, said winding 6—7 encircling a portion of the shaft 1. Flux conveying rods 8 extend longitudinally from the poles of the magnet 5 and a flux distributor, as hereinafter described, cooperates with said rods 8 to produce variations

in the magnetic flux interlinking with the winding 6—7 to generate induced electromotive forces. A circuit breaker, not shown, actuated by the magneto shaft 1, is operative in the circuit of the primary section 6 of the winding 6, 7 the secondary section 7 supplying high voltage to a high voltage distributor (not shown) and to cables leading from said distributor to engine sparking plugs; said breaker and high voltage distributor driven by the shaft 1 are not shown and may be of any approved or conventional type.

The flux distributor is fast with the shaft 1 and includes a hollow cylindrical core denoted in its whole by 9 and embracing the shaft 1 and connected with it in rotation, said core extending throughout the winding 6, 7; said flux distributor also includes two end stars 10, 11 extending transversely beyond the ends of the winding 6, 7 and providing spaced arms 10', 11' arranged at an angle from each other to provide, in cooperation with the core 9 and the rods 8, the requisite magnetic paths interconnecting the poles of the magnet 5 and to cause variations in the value of the flux flowing through the core 9 and interlinking with the winding section 6 to generate an induced electromotive force.

As illustrated, each star 10, 11 of the flux distributor includes a head 12 of non magnetic material which is fast with a flange 22 of the shaft 1 and a laminated ferromagnetic member 13 shaped to provide annular rim sections 10'', 11'' each having a radially extending arm 10', 11'; each laminated member 13 is fastened on the head 12 by means of a plate 14 and rivets 15.

In accordance with this invention the rivets 15 embodied in each rim section and arm 10', 10'', 11', 11'' are located in a plane having a diametrical location with respect to the shaft 1 and the whole of stars 10, 11; the rim sections 10'', 11'' of each star are segment shaped and are separate from each other by means of radial gaps 16 in the regions of said member 13 which are included between adjacent arms; said gaps 16 also intersect the fastening plates 14.

The described arrangement prevents any short circuit path in the stars 10, 11 because the rivets 15 of each rim section and arm 10', 10'', 11', 11'' are located in a plane parallel with the path of the flux through the concerned rim section and arm and such paths as provided by head 12, rivets 15, laminated member 13 and plate 14 do not intersect the flux lines extending through the concerned rim section and arm; on the other hand the gaps 16 separating the several sections of each star 10, 11 intersect such short-circuit

paths as would be provided by the rivets 15 of sections as 10', 10'', 11', 11'' adjacent to each other in each star 10, 11.

The assembly of the several sections of the flux distributor is provided by the fact that each section is connected by means of rivets 15 to the cooperating shaft head 12.

The central core 9 of the distributor which interconnects the two stars 10, 11 and extends throughout the winding 6, 7, is provided by longitudinal rods 17 each of which includes a laminated ferromagnetic member 18 embraced by two strips 19 their assembly being provided by flat rivets 20; the ends of the rods 17 enter the internal aperture provided by the rim sections 10'', 11'' of the stars 10, 11 and said rods 17 are clamped intermediate the two heads 12 of the distributor.

The laminations 18 are parallel with each other in each longitudinal rod 17 and each rod 17 is shaped to be symmetrical with respect to a middle longitudinal plane extending through its middle line  $x-x$  (Fig. 2) this line, when the rod 17 is assembled in the distributor, lying in a diametrical position with respect to the axis of the shaft 1. Best conditions are thus secured both in respect of machining of the rods 17 and in respect of the flow of the flux throughout the stars 10, 11 and rods 17 because by effect of the above described provision the edges of all the laminations 18 are substantially radial with respect to the axis of the core 9 consisting of the assembly of the rods 17 and consequently they are substantially perpendicular to the lathe tool in the lathe machining of the core as well as to the surface of contact with the star rim sections 10'', 11'' when said core is assembled with the stars 10, 11.

The rivets 20 interconnecting the laminations 18 and the side strips 19 of each rod 17 cannot

originate short circuit paths because they are aligned in the direction of the flux; such paths as could be provided in the transverse section of the core 9 by the strips 19 and the rivets 20 are cut by means of a gap 21 provided between two adjacent rods 17 and strip 19 (Fig. 2.).

The provision of the stars 10, 11 and of the core 9 by means of segmental sections 10', 10'', 11', 11'' and 17 respectively, as above described, further secures the advantage that the flow of the flux through the laminations of the stars 10, 11 and the laminations 18 of rods 17 of the core 9 is made uniform. In fact apart from the fact that the flow of the flux is uniform in respect of each rod 17 due to the substantially radial location of all the laminations 18 of the concerned rod, the separation of the stars 10, 11 in separate segmental sections 10', 10'' and 11', 11'' in register with several arms 10', 11' causes the flux flowing through each arm 10', 11' to follow a radial direction in the core 9; consequently any unevenness in the flux distribution and any flux dispersion around the core 9 as could arise from uneven gaps between the several sections 10', 10'', 11', 11'' and cooperating rods 17 of the core 9, are avoided.

A magneto equipped with the described flux distributor operates in usual well known manner; the rotation of the flux distributor 10, 9, 11 when driven by the shaft 1 in cooperation with the magnet 5 and the flux conveying rods 8 causes periodical variations in the value of the flux which flows through the core rods 17 and interlinks with the primary winding section 6; the operation of breaker inserted in the circuit of the winding section 6 generates high voltage induced electromotive forces in the winding section 7 which are supplied to the engine sparking plugs as well known.

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PUBLISHED

MAY 18, 1943.

BY A. P. C.

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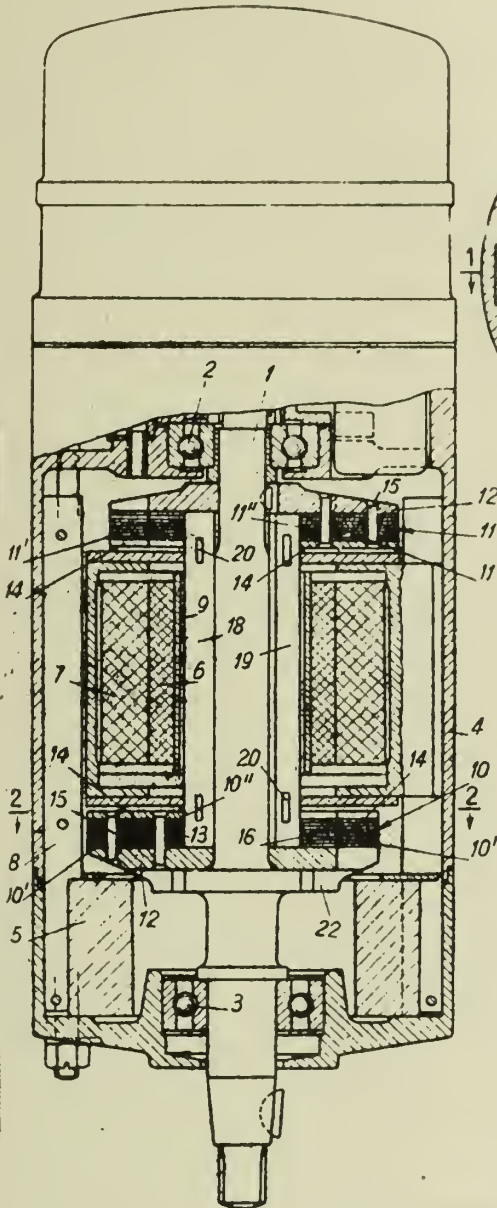
MAGNETIC FLUX DISTRIBUTORS

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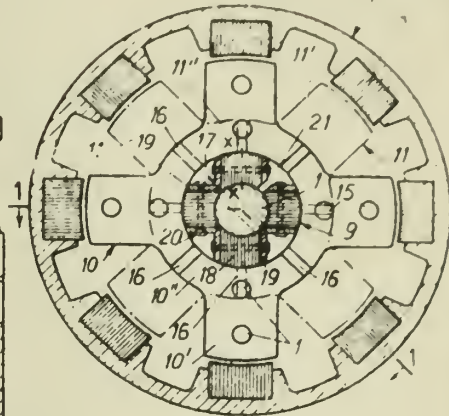
347,313

Fig. 1



Case D. P. 27, 1940

Fig. 2



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# ALIEN PROPERTY CUSTODIAN

## TELEVISION APPARATUS

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Application filed July 31, 1940

This invention relates to a wireless apparatus, more particularly suited for the reception of television pictures.

The features which distinguish this apparatus chiefly concern the synchronizing circuits, video frequency amplifier and video frequency reproduction circuits; they afford a completely self-adjusting synchronization together with a perfect response of the cathode ray tube to all video frequencies concerned.

The apparatus and the functions of the various circuits shall be described with reference to the accompanying drawing, in which:

Fig. 1 shows the portion of the electric diagram of the apparatus embodying this invention and includes the video frequency amplifier, cathode ray tube and synchronizing devices.

Fig. 2 shows the diagram of the synchronizing signals;

Figure 3 shows the process of separation of the amplitude differentiated signals in the case of the signals of the type shown in Figure 2;

Figure 4 shows the wiring diagram of the hold up tube;

Figure 5 shows a diagram of a synchronizing signal of another type, by which the separator secondary emission tube may be dispensed with.

The envelope of the video and synchronizing signals, after H. F. and I. F. amplification, is detected by diode V<sub>1</sub> and then applied to the control grid of tube V<sub>2</sub> which acts, at the same time, as a video frequency and synchronizing signal amplifier. Tube V<sub>2</sub> is of the secondary emission type, for instance of the Philips EE 50 type and can therefore supply amplified signals of opposite phase, which can then be taken from the anode and secondary cathode, respectively.

The direction of the synchronizing signals was heretofore generally opposite that of the video signals so that phase reversal was necessary in order to actuate the synchronizing devices. This is no longer necessary according to this invention which uses a secondary emission tube, as the tube itself can supply the two desired signals in opposite phase. Supposing by way of example the diagram of the synchronizing signals is that given in Fig. 2, the signals for the actuation of the synchronizing devices are taken from the secondary cathode, as shown in the electric diagram of Fig. 1, while the video signals are taken from the anode and applied to the control grid of the cathode ray tube V<sub>3</sub>, after having undergone a proper correction, the particulars of which will be explained in detail hereinafter. Owing to the direct coupling existing between the rectifying diode

and tube V<sub>2</sub> and between the tube V<sub>2</sub> and cathode ray tube, the medium shade also is totally reproduced.

The signals taken from the secondary cathode of tube V<sub>2</sub> (the amplitude of which depends upon resistor R<sub>5</sub>) are applied to the control grid of the amplitude separator tube V<sub>3</sub> through capacity C<sub>4</sub>. The tube V<sub>3</sub> also is of the secondary emission type (for instance EE 50 Philips type) and the main feature of the arrangement consists in a reactive coupling between the secondary cathode and screen grid. By virtue of said coupling the tube always operates (for input signals not below a certain limit, approximately 4-5 volts of the video synchronizing envelope) between a blocked condition existing during the video signals and a saturated condition existing during the interval corresponding to the synchronizing signals. For any value of the input signals amplitude (within certain limits) the amplitude of the separated synchronizing signals supplied by the secondary cathode of the tube V<sub>3</sub>, remains constant and of considerably high value (of the order of 140 volts). Moreover, by virtue of the reactive coupling C<sub>6</sub> existing between the secondary cathode and screen grid, the rectangular form of the synchronizing signals is further improved, while the sensitivity to external static is decreased.

From the secondary cathode of tube V<sub>3</sub> two frequency separator circuits, respectively, are derived for the frame and line signals. Said circuits may be differently arranged according to the type of synchronizing signals. The frame signals are separated by amplitude differentiation obtained by an integration process (circuit formed by elements R<sub>33</sub>, R<sub>32</sub>, C<sub>22</sub>).

The amplitude differentiated signals are then sharply discriminated by tube V<sub>4</sub> which may be a usual pentode. Fig. 3 shows the separation process in the case of signals of the type shown in Fig. 2.

As a consequence of the integrative process, the frame signals, are of a greater magnitude than line signals and this greater magnitude of the frame signals is utilized for obtaining a sharp separation by means of tube V<sub>4</sub>. The cathode of tube V<sub>4</sub> is made sufficiently positive to make the tube inoperative for the line signals; the frame signals only, having a greater magnitude as previously explained, can actuate the tube. Furthermore, the grid current of tube V<sub>4</sub> operates a sharp limitation of the upper part of the frame signals (see diagram Fig. 3), causing the current of the tube to assume a trapezoidal form characterized by two sharp variations which produce

in inductance  $L_2$  two voltage peaks, one of them being used to actuate tube  $V_5$ . The function of resistor  $R_{35}$  is to damp out of the oscillations which would follow each voltage peak.

The separation of the vertical synchronizing signals, operated by tube  $V_4$ , is necessary only if the synchronizing signals are of the type indicated in Fig. 2; said separation process does not permit the line signals following the frame signals to affect the duration of the oscillation produced by the oscillator tube  $V_5$ ; in this case, said influence would disturb perfect interlacing, owing to the different position of the frame signal with respect to the line signals which follow it in both cases, viz. when scanning the odd lines and even lines. Tube  $V_4$ , for instance, would no longer be necessary if the diagram of the synchronizing signals were that of Fig. 5.

The vertical synchronizing signals, separated by tube  $V_4$ , synchronize the pulse generator formed by the tube  $V_5$  also of the secondary emission type through  $C_{24}$ . The arrangement of the circuit of the tube  $V_5$  is characterized by a reactive coupling between the secondary cathode and control grid for the generation of the discharge pulses of capacity  $C_{27}$  which therefore generates through the charging resistor  $R_{41}$  saw-tooth shaped voltages synchronized with the frame signals as described in my copending U. S. application Ser. No. 340,617 filed June 14, 1940. The operation of tube  $V_5$  thus mounted is characterized by a great flexibility in performance which owing to the considerable amplitude of the actuating signal enables a perfect and completely automatic synchronization within very wide safety limits to be obtained.

The voltage applied to resistor  $R_{41}$  (500 Volt approximately) is stabilized by means of small neon bulbs  $S_2, S_3, S_4, S_5$  (the current drawn is approximately 0.5 Ma.) in order to avoid vertical fluctuation of the frame, caused by disturbances of a very low frequency reaching the apparatus through the supply circuit.

The saw-tooth signals generated by capacity  $C_{27}$  actuate through  $C_{28}$  the twin-pentode  $V_6$  operating in push-pull through cathode coupling. The function of the tube  $V_6$  is to generate saw-tooth currents which, flowing through the deflecting coil  $L_5$  generate the vertical magnetic deflection field.

By the push-pull arrangement for the generation of said currents a perfectly linear deflection may be obtained with the aid of very simple means. The potentiometer  $P_3$  makes the adjustment of the amplitude deflection possible and the potentiometer  $P_4$  provides the vertical centering of the frame. Finally, said push-pull arrangement has the advantage of permitting the elimination of the coupling transformer (or impedance) and of drawing practically constant current.

Tube  $V_6$  may be for example of the Philips ELL 1. type.

The line signals taken from the secondary cathode of tube  $V_3$  are separated by derivation by means of capacity  $C_9$  and synchronize the pulse generator formed by the secondary emission tube  $V_7$  (for instance of the Philips EE 50 type). Apart from the time constants which determine its natural period, said tube operates according to the invention in the same manner as the frame impulse generator formed by the tube  $V_5$  and is featured by the same stability character-

istics. Capacity  $C_{12}$  fed by resistor  $R_{53}$  generates a saw-tooth voltage synchronized by the line synchronized by synchronizing signals. The small neon bulb  $S_1$  operates initially only to limit the anode voltage of the tube  $V_7$  while the cathode is still cold. During normal operation the tube  $S_1$  must not be glowing.

The net formed by resistor  $R_{24}$  and capacity  $C_{13}$  gives rise to a desirable distortion of the saw-tooth in order to compensate for the curvature of the mutual characteristic of the tube  $V_8$ .

The line saw-tooth signal actuates the tube  $V_8$ , a high slope power pentode, for instance of the EL 6 Philips type, which generates the saw-tooth currents necessary for the generation of the horizontal deflection magnetic field.

The circuit of tube  $V_8$  is characterized in that a current negative feedback is provided in order to obtain considerable deflection linearity. The adjustable resistor  $R_{29}$  allows adjustment of the horizontal deflection amplitude by varying the amount of feedback. The horizontal deflection coils  $L_4$  are connected to tube  $V_8$  through a proper transformer  $T_1$ . The damping net  $R_{30}C_{16}$  renders the deflecting circuit aperiodic in order to avoid parasitic oscillations.

Horizontal centering of the frame is obtained by supplying the deflecting circuit with a proper amount of d. c. by means of the center-tapped potentiometer  $P_1$ .

The coils  $L_3$  provide the magnetic concentration of the cathode beam and focussing of the picture is obtained by adjusting the value of the variable resistor  $R_{31}$ . The anode and cathode supply of the cathode ray tube is obtained, according to the invention, by means of a special bridge circuit formed by elements  $R_{48}, R_{49}, R_{50}, R_{51}$  and  $C_{18}$ . The capacities  $C_{20}, C_{21}$  and  $C_{19}$  have a smoothing action.

Said bridge circuit is featured by the presence of a point M in which the voltage with respect to ground is independent from the current consumption of the cathode ray tube. Said voltage may be chosen within certain limits by properly designing the bridge elements and, according to the invention, the same voltage is used to feed the discharge devices which generate the saw-tooth line and frame signals needed for driving tubes  $V_8$  and  $V_6$ , respectively.

The voltage in question may be chosen of a considerably high value (for instance, 1000 volt with  $A_1 t \sim 5000$  volt) in order to obtain saw-tooth voltages of a very linear form and of considerable amplitude (as required, for instance, for the actuation of tube  $V_8$  owing to the feedback arrangement of the same). The resistor  $R_{51}$  which is an element of the bridge circuit, is properly designed in order to safeguard the cathode ray tube, should the  $A_2 t$  voltage (about 300 volt) accidentally fail.

In such case, the control grid of tube  $V_8$  would fall to ground potential, while the cathode of the tube would assume with respect to ground the voltage appearing across  $R_{51}$ , said voltage being chosen of a value sufficient to cause blocking of the tube. The current of the electronic beam of tube  $V_8$  flowing in resistor  $R_{51}$  produces a negative feedback effect, its value depending upon the frequency in relation with capacity  $C_{18}$ .

The lower the frequency, the greater the negative feedback will be and, according to the invention, it is totally compensated for by means of the net  $R_{50}C_3$  placed in the anode circuit of the

video frequency amplifier tube  $V_2$ . The effect of the net  $R_3C_3$  consists in an increase in the amplification of the lower frequencies and is such as to exactly compensate for the negative feedback just described.

The two small neon bulbs  $S_6$  and  $S_7$  stabilize the potential difference existing between the screen grid and cathode of the cathode ray tube  $V_3$ . Said stabilization is very useful, considering that the screen grid current of the cathode ray tube of the same type may assume widely different values. Potentiometer  $P_2$  allows adjustment of the average bias of the cathode ray tube and consequently varies the medium shade of the picture. The thermic delayed relay  $I_1$  avoids the formation of the luminous spot on the fluorescent

screen at the time when the set is switched on and the cathodes of the tubes are still cold.

The external controls of the assembly just described are reduced to a single control  $P_2$  for the adjustment of the medium shade. All other semi-fixed elements ( $R_2$ ,  $R_{2a}$ ,  $R_{31}$ ,  $P_1$ ,  $P_3$ ,  $P_4$ ) are inside the apparatus and are adjusted during the lining up of the set.

No control is provided for the adjustment of synchronization, as this is completely self-adjusting. Practically, it was found unnecessary to provide the set with controls of that kind owing to the wide safety limits of the synchronizing circuit.

GIUSEPPE ZANARINI.



PUBLISHED

MAY 18, 1943.

BY A. P. C.

G. ZANARINI

TELEVISION APPARATUS

Filed July 31, 1940

Serial No.

348,656

2 Sheets-Sheet 1

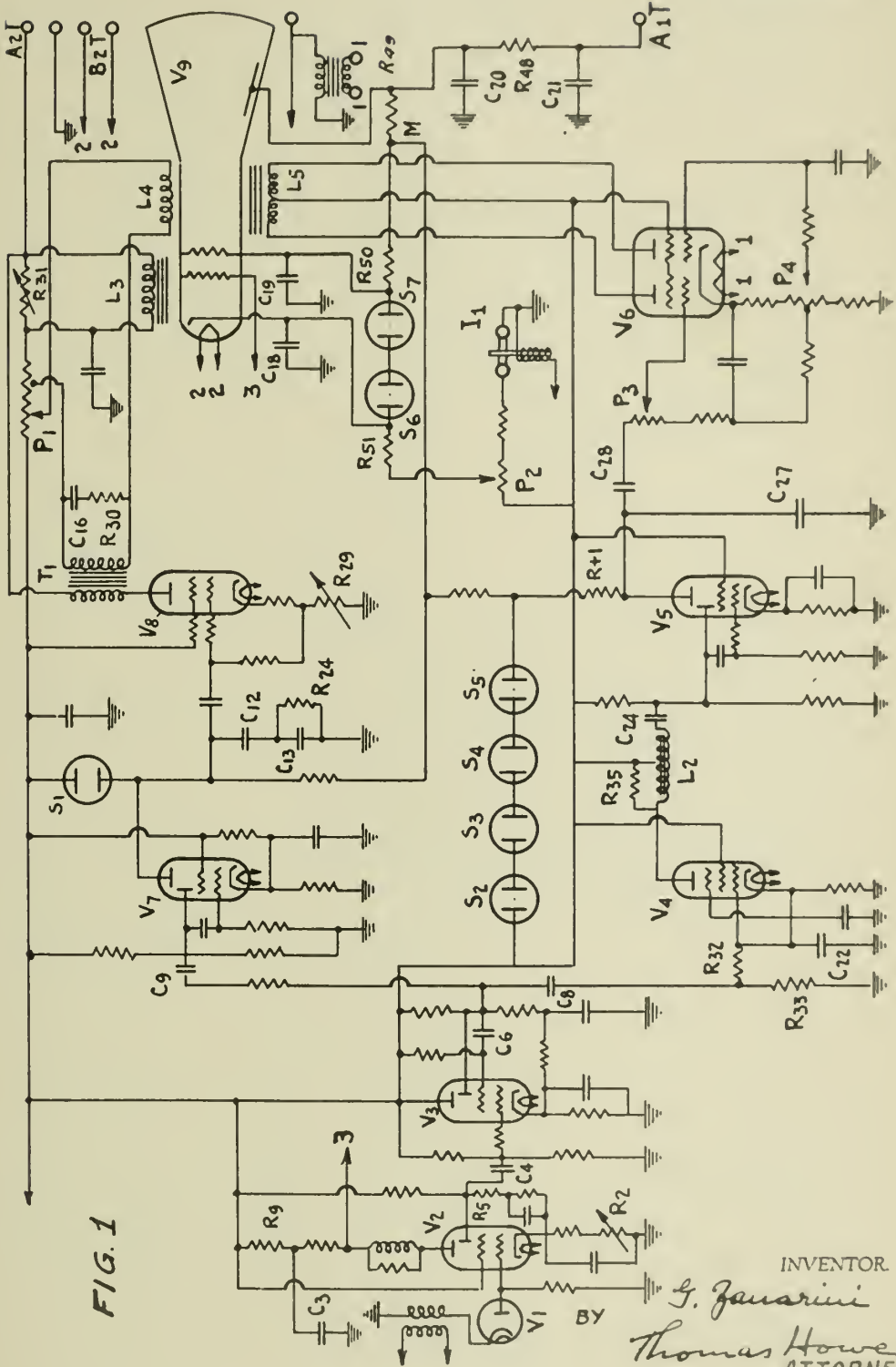


FIG. 1

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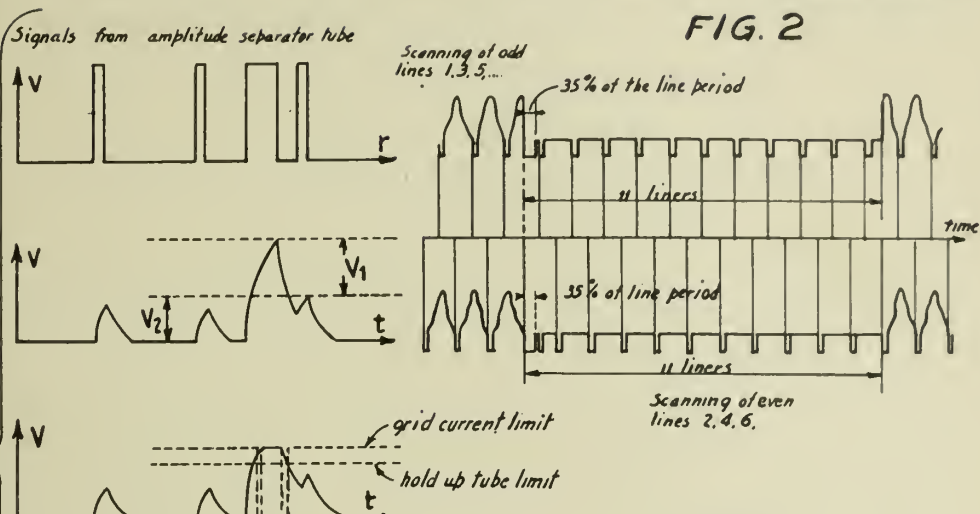


FIG. 2

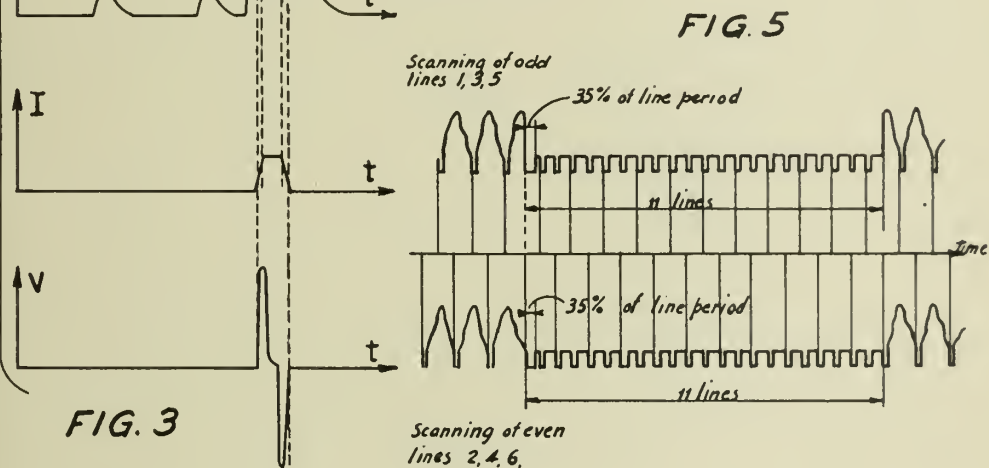
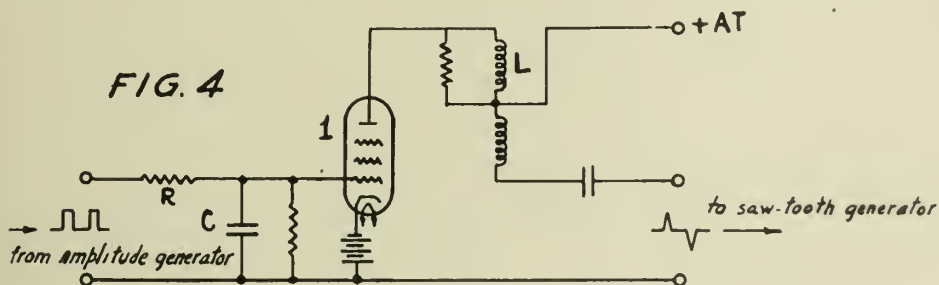


FIG. 5



G. Zanarini INVENTOR.

BY Thomas Howe ATTORNEY



# ALIEN PROPERTY CUSTODIAN

## PRODUCTION OF HYDROGEN BY ELECTROLYSIS

Franz Sledzianowski, Berlin-Charlottenburg;  
Germany; vested in the Alien Property Custodian

Application filed August 2, 1940

This invention relates to a method, system and plant for the production of hydrogen by electrolysis, using alternating current.

According to the present invention the hydrogen is produced from an aqueous solution by means of electrolyser cells filled with the electrolyte, said cells having pairs of mutually staggered electrode surfaces of high electric load and being connected to a source of alternating current. The system briefly stated operates in this manner that the electrolyte is enriched with an agent capable of fixing the oxygen which is set free during the electrolysis, the oxidation products being separated from the electrolyte.

Advantageously the cell aggregate of the electrolyser is constructed as a double cell aggregate including electrodes with extensions projecting into the respective opposite cell of the double cell aggregate.

The electric load of the electrodes may be, e. g., up to 300 amperes per square decimeter of the electrode surface, and the voltage may be about 1.6 to 1.8 volts per cell. Advantageously the temperature, current intensity and, as far as possible, also the concentration of the electrolyte are maintained constant during the electrolysis.

According to a preferred embodiment of the invention, a cyclic process is maintained by continuously separating the oxidation products from the electrolyte and re-enriching the electrolyte with fresh oxygen-fixing agent. An attack upon or decomposition of the electrode substance of the electrodes which, for instance, may consist of nickel plates of a large effective surface, is counter-acted in my process by the symmetrical arrangement of the voltage potentials and the anode depolarisation.

According to one embodiment of the invention the electrolysis is carried out under pressure, the pressure advantageously being adjustable. In this case the cell aggregate is arranged electrically insulated in a pressure tank which advantageously is provided with a water supply and a pressure control organ, the electrolyte passing through the pressure tank and the cell aggregate in a closed cycle. The pressure tank with the electrode aggregate may be provided with a collecting chamber for the hydrogen which is being produced in the electrolysis, the hydrogen being drawn from this collecting chamber and delivered to its place of use or to storage tanks.

According to a preferred embodiment of the invention a filter separator and a saturation vessel for the electrolyte mixture are connected to the pressure tank, through pipe lines including

shutting-off and control means, as well as a cooling device for the electrolyte. The filter separator and the saturation vessel should be constructed to permit their convenient filling and discharge. The electrodes are preferably disposed at different heights, in a slanting relationship, whereby the passage of gas and electrolyte and the separation of the oxidation products are facilitated.

My novel electrolytic system for the production of hydrogen is economic and reliable in operation, yielding a hydrogen of high purity; it is very suitable also for portable plants, since the hydrogen can be produced practically under any pressure by means of a plant of relatively simple and robust construction. The invention will be better understood by reference to the following detailed description in connection with the accompanying drawing showing by way of example and schematically an embodiment of the invention and in which:

Fig. 1 is a diagrammatic view of an electrode double cell aggregate having the invention applied thereto and

Fig. 2 is a longitudinal section through a pressure electrolyser plant including a cell aggregate in accordance with Fig. 1 disposed in the pressure tank.

Referring to Fig. 1, there are shown 20 working cells 1 to 20 in each cell aggregate  $Z_I$  and  $Z_{II}$ , respectively, the electrodes  $e$  of the two cells being disposed in pairs which are mutually staggered and insulated from each other. In addition, a converter cell  $O$  is arranged in series before each set of cells 1 to 20. The end of each electrode  $e$  extends into the opposite cell of the opposite cell aggregate. An electrolytic solution is disposed in, or passing through, all the cells, consisting, for instance, of an aqueous KOH solution of 30% strength enriched with an oxygen-fixing agent, for instance, sodium sulfite. The load of the electrode surface by the alternating current connected to the end cells may be, for instance, up to 300 amperes per square decimeter. The current after passing through the converter cells  $O$  causes production of hydrogen in the cells 1 to 20 of the two groups of cells  $Z_I$  and  $Z_{II}$ . The oxygen produced in the electrolyte owing to the effect of the reciprocal anode voltage and the depolarisation effect of the anode is fixed and crystallised out of the KOH solution in the form of a salt which can be eliminated, while the electrolyte in the course of the process is again enriched with the oxygen-fixing agent. If the electrolysis is carried into effect under pressure, the

speed of reaction of the oxidation increases with the pressure. The formation of the anode potential is favoured by the ends of the electrodes  $e$  extending with a certain area into the opposite cell, as indicated in Fig. 1.

Assuming for instance, that the alternating current enters into cell I of the upper series of cells  $Z_I$  in the direction of arrow I, Fig. 1, oxygen is produced at the electrode surface  $e_1$  while hydrogen is produced on the electrode surface  $e_4$ . A potential is produced which is rising until the maximum current intensity has been reached. On the other hand, a considerable stray effect with respect to the current is produced on the end of electrode plate  $e_2$  of the lower series of cells  $Z_{II}$  extending into cell I of the upper series of cells  $Z_I$ , during the opposite half wave of the alternating current flowing in the direction indicated by arrow II. Said stray effect acts as a counter potential, so that the oxygen is fixed to the oxygen-fixing agent, for example, sodium sulfite. Hence, only the hydrogen is continuously set free and may be collected in a suitable manner and drawn off from the cell aggregate. The above described process repeats itself in the direction of current indicated by arrow II as indicated with respect to cell 18 at the electrode  $e_3$  in the lower series of cells  $Z_{II}$  and similar effects are produced in the rest of the cells of the double cell aggregate.

Referring now to Fig. 2, it has been assumed that an electrode cell body A constructed in accordance with the principle of Fig. 1 has been mounted in insulated relationship in a pressure tank B. The plant of Fig. 2 is intended for carrying out a high pressure alternating current electrolysis. It will be noted that the electrode system B of the cell body A is disposed in a slanting relationship so as to favour the circulation of gas and electrolyte. The electrolyte may be the same as above, namely, an aqueous KOH solution of 30% strength which is enriched or saturated, for example, with sodium sulfite.

The electrolyte level R in the pressure tank B is provided to be somewhat above the cell body A. The hollow spaces of the salt separator C which is connected to the pressure tank B and provided with a salt filter insert D, as well as the cooling serpentine  $F_1$  and the saturation vessel H and the connecting pipes are also filled with the electrolyte. The screening basket J,  $J_1$  of the saturation vessel H is filled with the fresh oxygen-fixing agent, for instance, sodium sulfite.

If an alternating current of high current intensity is connected across the terminals L and M of the cell body A, the electrolytic process described above with reference to Fig. 1 takes place in the cell body A, at the electrodes P thereof. While the agent contained in the electrolyte, for instance, sodium sulfite, is enriched by the oxygen produced in this process and converted in the case of sodium sulfite, into sodium sulfate, the hydrogen which is being produced, rises with the heated electrolyte, through the discharge channel T, from the cell body A to the top and

is collected in the gas dome V thereof. The electrolyte current acts to wash or rinse the sulfate which is separated in the form of salt through the pipe line K and the control and shut-off organs  $K_1$ ,  $K_2$  into the sieve insert of the separator C in which the sodium sulfate is eliminated from the electrolyte. The electrolyte which after this elimination consists substantially of KOH solution only passes through the separator C, D and the control and shutting-off member  $C_1$  into the cooling serpentine  $F_1$  of the cooler F where it is cooled and allowed to pass, through the control and shutting-off member  $F_2$ , into the saturation vessel H. The electrolyte passes through the sieving basket J,  $J_1$  which is filled with sodium sulfite, thus again being saturated with fresh oxygen fixing agent, i.e., sodium sulfite. The electrolyte which is thus saturated, is directed from the saturation vessel H through the shutting-off and control member  $O_1$  and the pipe line O into the lower portion of the pressure tank B and, rising through the channel S in the cell body A, to the electrodes P thereof, where the above described electrolytic process and cycle is repeated.

The pressure of the hydrogen which is being produced during the electrolysis and collected in the gas dome V of the pressure tank B may be adjusted as desired by the overpressure valve N of the pressure tank and directed from the pressure tank to its place of use or to a storage tank. From time to time the salt filter D of the salt separator C must be discharged by means of the closure screw E; the sieve basket J of the saturation vessel H is filled at intervals by means of the closure screw G; the feed of water to the pressure vessel B at W should be maintained constant.

In the process according to the present invention there is substantially required the supply of electric energy, water, and oxygen fixing admixture only. The oxidation products which may be of different nature, depending upon the nature of the admixtures, are also commercially useful; if desired, these by-products may be dressed or prepared and improved in further processes, for rendering the electrolyte process still more economic.

If the temperature and current intensity are maintained constant, there is practically hardly any using up of the electrode material which for instance, may consist of nickel plates having a larger effective surface. Another advantage of the invention is the small space occupied by the plant and the simple and handy operation thereof.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

FRANZ SLEDZIANOWSKI.

PUBLISHED

F. SLEDZIANOWSKI

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PRODUCTION OF HYDROGEN BY ELECTROLYSIS

349,437

BY A. P. C.

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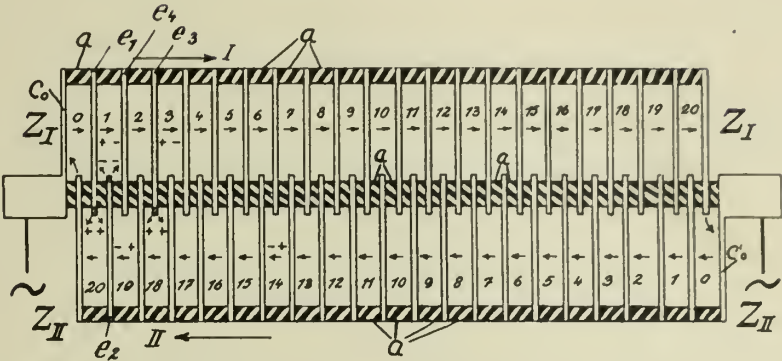


Fig. 1

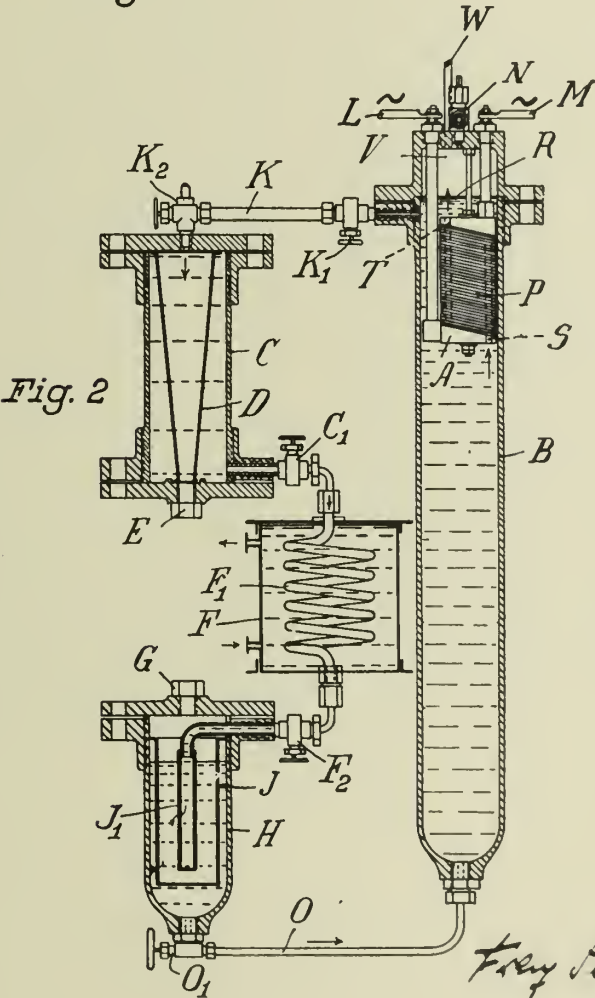


Fig. 2

Inventor:

Frey Redman



ALIEN PROPERTY CUSTODIAN

HYDRAULIC BRAKE FOR POWER DRIVEN  
VEHICLES

Josef Hartmann, Munich, Germany; vested in the  
Alien Property Custodian

Application filed August 3, 1940

The invention relates to internal shoe brake systems for automotive vehicles and particularly to those of the hydraulic or pneumatic type.

The present invention shows an advantageous device for equalising the application pressure on the brake shoes of internal shoe brake systems of the kind in which the actuation of the brake cylinder is effected preferably by hydraulic or pneumatic pressure and in which the brake shoes are preferably arranged symmetrically to each other, each brake shoe being pivotally mounted about a separate fixed fulcrum point in such a manner that one brake shoe is running-on, whilst the other is running-off the brake drum.

According to the invention, the brake cylinder is arranged vertically to the symmetry axis of the brake shoes and acts indirectly on the two brake shoes through levers by utilising the lever action, said levers being arranged for that purpose in such a manner that they bear on the one hand against the free ends of the brake shoes and on the other against fixed points on the back plate, on which they are mounted for pivoting movement, the length of said levers being chosen so as to obtain the same braking effect on each of the two brake shoes during service operation, i. e. when the drum is in rotation. The brake cylinder can be arranged, according to the invention, as well for acting upon the levers within the length between the bearing point of the free end of the brake shoe and the pivoting point of the lever on the back plate, as outside this length. In both cases, however, the longitudinal axis of

the brake cylinder does not coincide with the line of action of the expanding force acting on the brake shoes, as otherwise no action according to the invention could be obtained.

An example of construction of the subject of the invention is shown in the accompanying drawing.

The arrow in the drawing indicates the direction of rotation of the brake drum 1. The brake shoe running-on the brake drum is 2 and 3 is the running-off brake shoe under the unloading influence of the frictional force. The brake cylinder 4 provided with a thoroughly stepless internal bore is arranged vertically to the symmetry axis of the brake shoes and acts indirectly on the brake shoes through the levers 5 and 6, which on the one hand bear against the free ends of the brake shoes and on the other are pivotally mounted about the fixed points 7 and 8 on the back plate 9. The distance of the fulcrum points 7 and 8 of the levers from the bearing points of the brake cylinder on the levers is different for each of the two levers, so that the force transmitted through the levers to the brake shoes is likewise different. By suitably dimensioning the length of each lever, taking into consideration the different effects of the running-on resp. the running-off brake shoe, a completely uniform application of the brake shoes during service operation and thus a uniform wearing of the brake shoe linings can be obtained.

JOSEF HARTMANN.



PUBLISHED

MAY 18, 1943.

BY A. P. C.

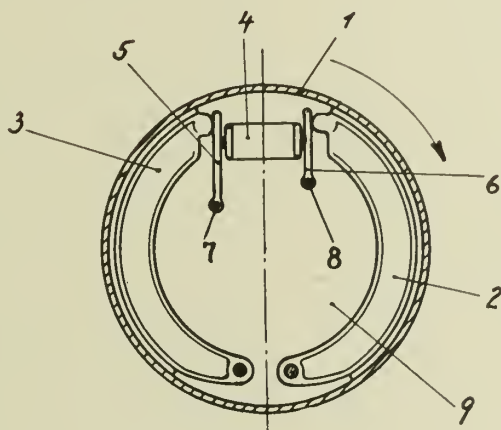
J. HARTMANN

HYDRAULIC BRAKE FOR POWER DRIVEN VEHICLES

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INVENTOR  
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# ALIEN PROPERTY CUSTODIAN

## ELECTROPLATING BATH

Robert Weiner, Francfort-on-Main, Germany;  
vested in the Alien Property Custodian

No Drawing. Application filed August 3, 1940

My invention relates to the manufacture of electroplating baths, particularly alkaline reacting complex baths, i. e. cyanide baths for the electrodeposition of metals and metal alloys such as, for instance, silver, gold, copper, zinc, cadmium, brass.

With alkaline reacting complex baths I mean baths which contain the metal to be deposited not in the form of a simple kation but essentially as a complex ion whereby in addition to alkali metal compounds, the metal, or metals are present in a dissolved state, for instance, in form of a cyanide. Such baths may, for instance, contain silver as sodium silver cyanide or copper as copper cyanide, and in addition thereto alkali cyanide and alkali carbonate.

Hitherto it was known to add brightening agents to the electroplating baths of the above mentioned type, so for instance, sulphur or sulphur compounds such as carbon disulphide, sodium thiosulfate and the like. These additions, however, are not efficient if stronger deposits, for instance 4 g silver/dm<sup>2</sup> (that is a 90% silver plating) are desired. The deposited metal is then dull and needs an after treatment in order to obtain a high polished surface. This after treatment may be carried out for example by raking with steel brushes, steel polishing and subsequent burnishing and polishing with a felt disc.

It is further known to add colloidal substances to strongly alkaline silver salt baths containing free caustic alkali, in order to obtain coatings with a bright surface. These baths, however, have the disadvantage as they will more or less readily decompose whereby the decomposition products exert a harmful effect on the electrolysis.

Now I have made the surprising observation that with the above mentioned alkaline complex baths bright metal coatings of an extraordinarily hardness may be obtained if selenium and/or tellurium compounds are present in the electrolyte. The bath solution may contain, for instance, 0.01–20 g/litre selenium or tellurium or both in form of soluble compounds, for instance, as sodium selenite. The presence of selenium or tellurium compounds in the bath solution makes it possible to work with current densities of 0.3–4 amp/dm<sup>2</sup>, for instance, of about 1.5–4 or 2.5–4 amp/dm<sup>2</sup>. On account of the possibility to work with elevated current densities the time of electroplating may, in comparison with the known processes, be shortened considerably. Silver platings which hitherto needed 3–4 hours opera-

tion time may now be carried out in the fifth or tenth part of the usual time.

The coatings according to my invention show an excellent hardness. Comparative tests have shown that silver coatings according to my invention have a Brinell coefficient of hardness of about 90–100, whilst silver coatings deposited according to the hitherto known processes show only a Brinell hardness of about 30–40.

The abrasive hardness of the silver coatings was more than twice as great as the abrasive hardness of coatings manufactured according to the former processes.

The extreme hardness of the silver coatings according to my invention involves a lesser abrasion and a better conservation of the brightness.

The objects treated in accordance with my invention emerge from the electroplating baths with an excellent brightness which needs no after treatment such as scratching, polishing with steel or the like. In consequence thereof, losses of material are avoided and working hours saved. Furthermore, the intermediate scratching treatment during the plating process and the losses caused by rinsing may be omitted. It is only necessary to slightly polish with a felt disc in order to produce the final high brightness.

The utilization of selenium or tellurium in silver electroplating, for instance, for knives, forks and spoons, is absolutely without any danger for the human nutrition as the brightening agents cannot be detected in the silver coatings.

One modification of my invention also includes the addition of other brightening substances to the bath besides the soluble selenium or tellurium compounds. These further additions are, for instance, sulphur compounds such as carbon disulfide, thio urea, ammonium thiocyanate, sodium thiosulfate and the like. The bath solutions may contain these sulphur compounds in quantities of, for instance, 0.1–50 grs./litre. The brightness of the metallic coatings may thereby be increased to a certain degree. Moreover, organic brightening substances, preferably aromatic aldehydes and their derivatives, as for instance, piperonal, anisaldehyde, cumarin and the like may be added to the bath solutions. In using such additional substances excellent bright coatings may be deposited over a wider range of current densities than otherwise possible. This exerts a favorable influence on the formation of the metallic coatings as it is possible to produce practically uniform thick and beautiful coatings as even on concave objects like spoons.

In electrodeposition baths which besides seleni-

um and tellurium cyanides contain also other additions such as sulphur compounds or organic brighteners or both of them I may work also with current densities up to 4 amp/dm<sup>2</sup>. The electrolysis is preferably carried out at ordinary temperature with slight agitation of the bath.

Further investigations have shown that proteolytic products condensed with organic acids, especially fatty acids, known under the trade marks "Lamepon" A, B, D and C or Lamephan, are excellent brightening agents for alkalicyanide electrodeposition baths, particularly baths for the electrodeposition of silver, gold, copper, zinc, cadmium and brass coatings. Perfect effects may be obtained if condensation products of the above mentioned type kind are added as brightening substances to the plating baths containing selenium and tellurium. The coatings resulting from these baths show a special brightness. It is particularly advantageous to use these brightening additions in the treatment of concave or shaped articles, such as, for instance, spoons and also in the treatment of highly polished articles. Through the simultaneous presence of selenium and/or tellurium compounds and of proteolytic products condensed with organic acids the brightening effect is improved over a wider range of the current density in such a degree that also in the deepest points of concave objects a uniform brightness is attained and dull places in these hollows avoided. Baths according to my invention are also suitable for the manufacture of stronger coatings. It is possible to produce bright layers of a thickness of 4 grs/dm<sup>2</sup> and even more, if polished bases are used.

The amount of the brightening condensation products in the baths may vary in a definite range: 1 litre of a baths solution may contain, for instance, about 1-10 grs, preferably 0.5-1 g of the above mentioned additions.

Instead of alkali cyanide baths the well known thiocyanate baths may also be used, for instance, such which contain potassium silver thiocyanate or sodium silver thiocyanate in addition to free alkali thiocyanate.

#### Examples

1. The objects to be electroplated, for instance, knives, forks and spoons are degreased and immersed in a bath of the following composition:

Silver as sodium silver cyanide.....	grs---	30
Free potassium cyanide.....	grs---	30
Potassium carbonate .....	grs---	30
Selenium as sodium selenite.....	grs---	2
Sodium thiosulfate .....	grs---	0.5
Water.....	liters---	1

The cathodes are slightly agitated and the electrodeposition is carried out at 2.5 amp/dm<sup>2</sup>, 1.6-1.8 volt during 24 minutes at room temperature. Current efficiency anodically and cathodically 100%. A silver coating of 4 grs. silver per dm<sup>2</sup> which is equal to a 90% silverplating was obtained. After rinsing the surface of the treated object is smooth and bright. Brinell coefficient of hardness 95. If desired, the objects to be electroplated are degreased and may then be dipped

in a known way into a solution of mercury salts and mercurized whereupon they are electroplated according to my invention.

2. Instead of the plating bath in Example 1, the bath solution may have the following composition:

Silver as sodium silver cyanide.....	grs---	30
Free potassium cyanide.....	grs---	30
Potassium carbonate.....	grs---	30
Selenium as sodium selenite.....	grs---	2
Sodium thiocyanate .....	grs---	5
Anisaldehyde as a bisulfite compound.....	grs---	1
Water .....	liters---	1

The article to be treated in this bath according to the prescription in Example 1 obtained a high polished silver coating after a time of 30 minutes. Brinell hardness 90.

3. After degreasing the object is brought into the following plating bath:

Sodium cyanide .....	grs---	48
Copper cyanide.....	grs---	30
Sodium carbonate .....	grs---	30
Sodium tellurite .....	grs---	2
Water .....	liters---	1

The electroplating is carried out in 30 minutes with a current density of 1.7 amp/dm<sup>2</sup> and an agitated cathode. The copper coating is bright, Brinell and scratch hardness far better than with coatings from a usual copper plating bath. The object is rinsed and treated with the felt disc until an excellent brightness is attained.

4. The objects are cleaned and degreased and then dipped into a bath of the following composition:

Silver as potassium silver cyanide.....	grs---	40
Free potassium cyanide.....	grs---	30
Potassium carbonate.....	grs---	30
Selenium as sodium selenite.....	grs---	5
Sodium thiosulfate .....	grs---	0.5
Lamepon A .....	grs---	1
Water.....	litres---	1

The plating is carried out at room temperature with slightly agitated cathodes, current densities of 3 amp/dm<sup>2</sup> with 1.6-1.8 volt during a period of 20 minutes. The current efficiency is anodically and cathodically 100%. The silver deposit obtained is bright and has a thickness of 4 grs/dm<sup>2</sup>. Brinell hardness 95. The polished obtained articles show also in the hollows of the article a uniform smooth and bright coating.

5. A bath of the following composition:

Silver as potassium silver cyanide.....	grs---	30
Free potassium cyanide.....	grs---	30
Potassium carbonate .....	grs---	30
Selenium as sodium selenite.....	grs---	5
Sodium thiocyanate.....	grs---	5
Lamephan .....	grs---	1
Water .....	litres---	1

is used. Here the object is treated nearly 30 minutes. The silver coatings are everywhere uniform and perfectly bright Brinell hardness 90.

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# ALIEN PROPERTY CUSTODIAN

## PROCESS OF IMPROVING THE PLASTIFICATION OF NON-METALLIC ELECTRIC RESISTANCE MATERIALS

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vested in the Alien Property Custodian

No Drawing. Application filed August 5, 1940

This invention relates to a process of plastifying non-metallic electric resistance materials with the object to increase their plasticity by treating same by means of an extruding press.

The materials which are fit for the production of technically useful non-metallic resistance bodies, particularly such materials which, prior to the proper plastification process, are subjected to a pre-sintering or pre-melting procedure and which are in a crystalline state, are not to be maintained in the desired plastic condition by the binders generally used when plastification is imparted by pressure, such as water glass, sirup, or sulfite liquor. On the other hand, the methods for the production of plastic refractory masses as employed in the ceramic industry are unsatisfactory in this case because ceramic products as for instance clays, even in smallest quantities, may not be added to the resistance materials since already the presence of a small amount would entirely change their electric properties.

The following conditions are to be maintained for the plastification of electric resistance materials:

(1) Binders and sliding agents of organic type must be removable at the drying or pre-burning stage without residues.

(2) Inorganic additions, unless they will be volatilized when burning, must be of such a nature that they have no, or if any, only a favourable action upon the electric properties of the resistance mass. Their main object is to fill up the tiny spaces still present between the single granules of the primary mass so as to form a compact or dense body. Moreover, owing to their swelling capability caused by the absorption of water, they will support the organic binding and sliding agents by their tendency to agglomerate afterwards and by coating the mass grains and thus rendering same round.

(3) The amount of added organic agents should conveniently be kept small so that a too considerable porosity of the masses which have been sintered after the plastification procedure is avoided.

According to the invention, the additives employed for plastifying the masses mentioned above are divided into three kinds of which at least one of each kind must be present.

(1) Agents for insuring the cohesion during the plastification stage, i. e. agglutinants or proper binders. There may be used: lacquers, varnishes, glues, sirup, etc.

(2) Agents for rendering supple or sliding agents such as fatty substances, soaps, oils, emulsions, etc.

(3) Amorphous metal oxides of a high temperature-resistance to fill up the spaces between

the single little crystals of the primary mass, which are finely divided and may be won by precipitation. For example, certain oxides may be used for this purpose which, during the sintering procedure are incorporated throughout the resistance masses, thus forming either equal or similar chemical compounds of an higher order, or reacting with the primary mass to form a solid solution without having a detrimental action on the electric properties of the treated mass.

It is a supposition for the combined use of the three kinds of additives that those employed at once should not repel each other. For example, as sliding agent there should not be added a water repelling heavy mineral oil to a water soluble agglutinant such as dextrine (British gum). Of the ingredients indicated under number 3 those substances are particularly suitable which, finely divided, show a strong agglomerating tendency as for instance zinc oxide. Depending on the nature of the particular starting material for the resistance body the suitable inorganic additives are to be selected. Thus, for instance, iron oxide is used in resistance masses of a spinell type, having the property to turn into magnetite (ferrosoferric oxide) when burnt up to 1200° C., which itself is of a spinell type and, due to its isomorphisme, will react with the base substance forming an intimate combination (solid solution). For base substances of a zincite character zinc or cadmium oxide are to be chosen. The following may serve as an example for an entire composition of primary material and admixtures.

In order to plastify a base mass consisting of magnesium ferrite one should take as substance 1: 5% of linseed oil varnish, as substance 2: 5% of soft soap and as substance 3: 10% of finely divided iron oxide which, if desired, has been obtained by precipitation.

When processing the thus composed mass one has to operate in the following manner: First the substances 1 and 2 are well intermixed or, if necessary i. e. if they should first repel each other, emulsified. Thereupon substance 3 is added and mixed with 1 and 2 until a thin, homogeneous paste is obtained. The base substance is then introduced therein with constant kneading until the intended quantity or the desired consistency have been obtained.

In general, the quantity of the volatile additives may be kept as small as to amount altogether at most to ten per cent, based on the weight of the whole material. This is absolutely necessary in order to yield densely sintered resistance bodies and to avoid too great a shrinkage when burning.

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# ALIEN PROPERTY CUSTODIAN

## ELECTRIC LEADING-IN ARRANGEMENTS

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Application filed August 10, 1940

It is highly important to the life of roll-type condensers that the condenser reel, that is, the condenser proper encased in a suitable container, be sealed hermetically. Experience has shown, however, that this cannot be accomplished with the aid of the customary sealing or embedding means. In order to overcome this drawback the practice has been to insert the dielectric, made up in the form of a wound body or pack, in a metallic container and to seal this, as far as ever possible, by soldering. Such soldering, however, meets with difficulties which are due to the arrangement of the lead to the condenser reel, this arrangement constituting an electric insulation for such lead. It has been proposed therefore that a metallized ceramic tube be soldered into the wall of the container or that a metallized tube be sealed into it with the aid of a glass bead. The glass of which such bead consists and the metal parts sealed thereto should, as far as possible, have the same coefficient of expansion. The latter process appears to be best, but there is still the drawback that it is difficult to arrange in the metal wall of the container a lead to which a comparatively large cross-sectional area is peculiar. In addition the iron alloys of which such leads are usually formed are not suitable in the case of high current intensities since these alloys have too small a conductivity and in most cases also have magnetic properties. The best material for making the leads is copper. Copper and glass, however, are not easy to seal together.

The present invention enables the lead to be of a well-conducting material, such as copper. For this purpose the lead is arranged to extend through a metal tube to which it is soldered outside the container. Such tube, which should be comparatively thin-walled, is sealed into the container and is arranged so that its expansion, which depends on that of the lead, shall not affect the seal by which the tube is hermetically fastened in the wall of the container.

The drawing shows a fragmentary sectional view of one embodiment of the invention.

The lead *d* expands through a metallic tubular member or tube *b* and is secured to it by a soldered joint *e*. Tube *b* is sealed into an annular metal disc *c* by means of a glass body or by other suitable material *a*. Disc *c* serves to fasten the assembly *a*, *b*, *c*, *d*, *e* to a container or casing *g* by soldering and therefore is preferably tinned. In the case of a condenser, for example, casing *g*, which is shown as broken away, contains the reel or wound body thereof with which the lead *d* is connected in a well-known manner not illustrated here. Tube *b* has a annular constriction *f* at the soldered joint *e* and which is arranged to contact with the lead *d* in order to prevent the soldering material from flowing through the tube into the region of the seal *a*.

It will be seen that the lead *d* when expanding is not able to cause any strain in the seal *a*. The leading-in device here disclosed hence can be given any desired size and will be suitable for any cross-sectional area of the lead. Furthermore, the seal *a* is so rigid and durable that no leakiness can occur on soldering the disc *c* to container *g* nor on subjecting the device to a temperature of 60°C.

The parts *a*, *b*, *c* should preferably have the same coefficient of expansion, or nearly so.

Instead of only one constriction *f* two or more may be provided.

This invention will be useful, for instance, in the case of condensers arranged to prevent disturbances in well-known manner, as in this case the lead *d* must have a very large cross-sectional area and must be sealed into the container *g* in a manner to render the leading-in device heat-proof and vacuumtight. The provisions heretofore proposed in this regard are not able to perform this to the same degree of perfection.

HERMANN GÖNNINGEN.



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MAY 18, 1943.

BY A. P. C.

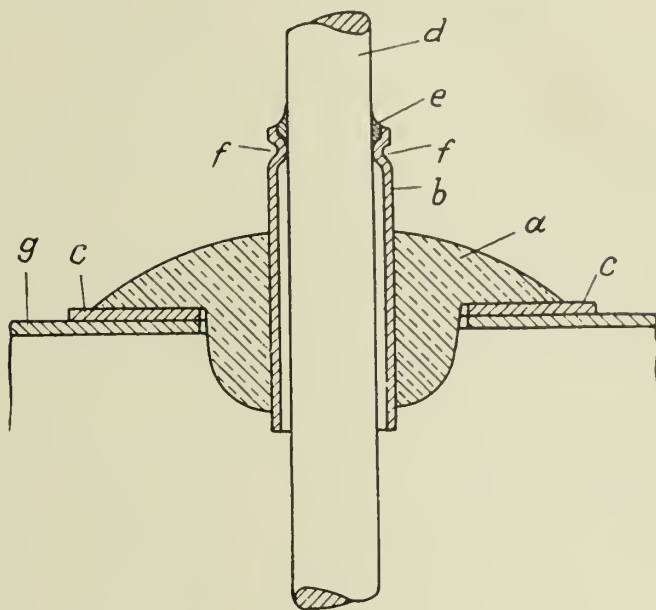
H. GÖNNINGEN

ELECTRIC LEADING-IN ARRANGEMENTS

Filed Aug. 10, 1940

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# ALIEN PROPERTY CUSTODIAN

## CONVEYOR MECHANISM FOR USE IN CONNECTION WITH MACHINES FOR CASTING CHOCOLATE AND THE LIKE

Kai Christian Sophus Aasted, Gentofte near Copenhagen, Denmark; vested in the Alien Property Custodian

Application filed August 10, 1940

My invention relates to a conveyor mechanism for use in connection with machines for casting chocolate and the like. The invention can be used in connection with machines adapted either to cast solid chocolate or the like in the form of cakes or pastilles or to cast chocolate shells which is filled with another mass to form creams. In certain cases the invention can also be applied to machines for coating arbitrary goods with chocolate.

In chocolate casting machines it is common practice to use a conveyor belt of considerable extension, serving to carry mould plates through various sections of the machine. Said mould plates are provided with cavities in which the chocolate is cast. After the casting operation the mould plates are carried through a refrigerating chamber in which the chocolate is congealed. Then the mould plates are turned upside down and the cast chocolate pieces are discharged by beating or by vibrating the mould plates. Finally the empty moulds are heated and carried back to the place of casting. During the whole cycle the mould plates remain in connection with the conveyor belt.

In such machines it is known to connect the mould plates fixedly to the conveyor belt so that they always occupy the same position as the latter, which involves that the conveyor belt after the place of casting must have horizontal flights of considerable length as it can not be carried upwards or downwards before the chocolate is mainly stiff.

It is also known to connect holders carrying the mould plates to the conveyor belt by means of studs at the leading edge of each holder. The holders then normally slide in horizontal position over guides arranged along the path of the conveyor belt and by special means it is possible to retain this horizontal position of the holders when the conveyor belt is led over a pulley between two horizontal flights thereof. This, however, leads to complicated mechanisms which are subjected to a material wear during use.

The main object of the invention is to obviate these drawbacks and to provide a conveyor mechanism in which the angle position of the mould plates is made independent of the direction of movement of the conveyor belt and in which the angle position of each mould plate can be altered at an arbitrary stage of its travel and to an arbitrary degree.

Another object of the invention is to arrange the conveyor mechanism in such manner that it

can be driven by small power and without material wear.

A further object of the invention is to provide means by which the mould plates can be connected to frames carried by the conveyor belt in a reliable manner so that the mould plates are held safely locked to the frames during the operation of the conveyor belt, irrespective of the angle position of the mould plates in the space.

According to a further object said latter means should be so constructed that the mould plates can be connected to and removed from the mould frames by simple manipulations.

The invention is illustrated by way of example in the accompanying drawings, in which

Fig. 1 is a top view of a mould plate arranged in a mould frame carried by a conveyor belt formed by two roller chains, parts being broken away to show the means by which the plate is locked to the frame,

Fig. 2 is a side elevation of the same parts partly in section along the line II—II in Fig. 1,

Fig. 3 shows the mould frame in a perspective view,

Figs. 4, 5 and 6 show the mould frame as viewed from one end and guided by guiding members under different circumstances and in different positions,

Fig. 7 is a perspective view showing part of one roller chain as it passes a sprocket wheel and partly two mould frames carried by the chain and the means used for guiding the frames during their passage from the upper to the lower horizontal flight of the chain,

Fig. 8 shows the same with the exception that the two chain flights form a right angle to each other and that the guiding means are suited to this altered conditions.

Fig. 9 shows at a reduced scale the means used for turning a mould frame during the advancement of the conveyor belt.

As shown in Figs. 1 and 2 each mould consists of a metal plate 12 provided with depressions 14 forming mould cavities. The edges of the plate 12 are secured, e. g. by soldering, to a circumferential flange 16, the end pieces of which are provided with inclined faces 18, by which the mould plate is locked to the corresponding mould frame, as will be described later on.

The mould frame, as appears from Fig. 3, is formed by two end plates 20 and two side pieces 22 of T-shaped profile. The mould frame is arranged rotatably on a rod 24 connecting two roller chains 26, Figs. 1 and 2, forming together the previously named conveyor belt. To each

end of the rod 24 is secured a cross-piece 28 which in turn is connected to the appartaining chain 26 by means of two successive link bolts of the latter.

The mould frame 20, 22 is journalled on the rod 24 by means of ball bearings, not shown, arranged in casings 30 secured to the outer faces of the end plates 20. To the outer side of each casing 30 is secured an oblong guiding piece 32 having two straight parallel guiding edge faces 34 and at each end two inclined edge faces 35 forming with the faces 34 an angle of 45 degrees, as it appears most clearly from Fig. 3. The two guiding pieces 32 at opposite ends of the mould frames 20, 22 are arranged at right angle to each other. The purpose and operation of the guiding pieces 32 will be explained later on.

Inside each frame two latch pieces 38 and 40 are arranged, each being provided at its top with two projections 42 having a hook shaped cross-section, the hooks on the two pieces 38 and 40 facing against each other. The latch piece 38 is secured to the mould frame, e. g. by its ends being welded to the side pieces 22. The latch piece 40 is displaceable in the mould frame, guided partly by a bushing 44 secured to the piece 40 and slidable on the rod 24 and partly by the ends of the piece 40 sliding along the body of the T-profile of the side pieces 22. The piece 40 is yieldingly pressed against the piece 38 by means of coiled springs 46 surrounding studs 48 secured to one of the plates 20 and provided with enlarged heads 50 restricting the displacement of the piece 40 against the piece 38, vide Fig. 1.

When a mould plate 12 is to be connected to the corresponding mould frame 20, 22 the face 18 at its left hand end, as viewed in Fig. 2, is pushed in beneath the hook shaped end of the projections 42 on the latch piece 38, the flange 16 at the right hand end of the mould plate 12 resting at this time on the inwardly inclined hook faces at the top of the projections 42 on the latch piece 40. When now a downward pressure is exerted on the mould plate 12, especially on the right part thereof, the latch piece 40 will be displaced to the right against the action of the springs 46 sliding mainly on the rod 24, and at last, when the lower edge of the flange 16 has passed the end of the hooks, the latch piece 40 will be moved backwards by the springs 46 with a snap action and the mould plate 12 will be held locked securely in the position shown in Fig. 2. In this position the lower part of the edge flange 16 on the mould plate 12 will be surrounded at all sides by the corresponding mould frame 20, 22 so that the mould plate can not be displaced laterally and thereby be disengaged from the mould frame. The mould plate can be unlocked only by displacing the latch piece 40 to the right as indicated by an arrow in Fig. 2. To this end the piece 40 has a downward extension 41 which can be acted upon either by hands or by a stationary cam, not shown, during the movement of the conveyor belt.

When the conveyor belt, i. e. the chains 26, are moved during the operation of the chocolate casting machine the guiding pieces 32 are used for holding the mould frames and thus the mould plates in certain predetermined angle positions. Generally it is wished to keep the mould plates in a horizontal position. If the conveyor belt moves in a horizontal direction, as shown by an arrow in Fig. 4, one guiding edge 34 of the back guiding piece 32 slides along a stationary guiding member in the form of a metal band or

strip 52 arranged along the path of the conveyor.

If the conveyor belt moves in a vertical direction, as indicated by an arrow in Fig. 5, one guiding edge 34 of the front guiding piece 32 slides along a stationary guiding member in the form of a metal band or strip 54 arranged along the path of the conveyor at this part of its travel. It will be understood that the bands or strips 52 and 54 are arranged at opposite sides of the path of movement of the mould plates and frames and inside the conveyor chains. As the guiding pieces 32 and their corresponding guiding members are spaced to a considerable degree perpendicular to the longitudinal direction of the conveyor belt, it will be evident that no exact construction of the mechanism is required to secure that each guiding member will co-act with its own guiding piece only.

In Fig. 6 it is supposed that it is wished to keep the mould plate and thus the mould frame in a position forming an angle of 135 degrees to the horizontal direction. In this case a horizontal guiding strip, 56 and 58 respectively, is arranged at either side of the horizontal path of movement of the mould plates and frames, each co-operating with one inclined edge face 36 on the corresponding guiding piece 32, the active faces 36 lying at opposite sides of the axis of rotation of the mould frame, thereby securing the frame positively in the position in question. By using other of the inclined faces 36 on the guiding pieces 32 it will be possible to obtain other angles than 135 degrees to the horizontal or vertical direction.

In Fig. 7 is illustrated how the mould frames are guided when passing from an upper horizontal flight to a lower horizontal flight of the conveyor belt. In this figure is shown one of the conveyor chains 26 running over a sprocket wheel 60. A mould frame 20, 22 of the previously described kind journalled on the shaft 24 has just arrived at the sprocket 60. The back horizontal guiding piece 32 on the frame 20, 22 has just leaved its guiding strip 52, cfr. Fig. 4, and at the same time the front vertical guiding piece 32 abuts against the vertical guiding edge of a yielding guiding member 62 supported by arms 64 from a shaft 66 which is mounted swingable in suitable bearings, not shown. The guiding face of the member 62 is preferable parallel to the axis of the shaft 66. The frame formed by the member 62, the arms 64 and the shaft 66 is acted upon by a spring which schematically is shown as a coiled spring 68, the ends of which are secured to one arm 64 and a fixed point 70, respectively.

When from the position shown the chain 26 is moved in the direction indicated by the arrows at its ends, the guiding member 62 will remain resting against the corresponding guiding piece 32 with a pressure exerted by the springs 68. Thus the mould frame 20, 22 will remain in a horizontal position during its passage to the lower chain flight and simultaneously the guiding member 62 will be swung a certain angle to and fro about the axis of the shaft 66. When the mould frame has reached the lower position shown, its back guiding piece 32 will be guided by a guiding strip 52' similar to the strip 52 during the further horizontal movement of the frame.

It will be understood that two successive mould frames will occupy the positions shown in Fig. 7 and that accordingly the front guiding piece 32 on the lower mould frame will be released from the guiding member 62 when the front guiding

piece 32 on the upper mould frame reaches the said member 62.

In Fig. 7 72 represents rails on which the chain rollers of the upper and lower flight of the chain are running.

When the two flights of the chain 26 running over the sprocket wheel 60 form a right angle, as shown in Fig. 8, the guiding member, as shown at 62', is shortened so that from the upper arm 64 it extends to the level of the axis of the sprocket 60 only. When the sprocket 60 has been turned a quarter of a revolution from the position shown, the front guiding piece 32 has swung the guiding member 62' to a position in which it is flush with the front surface of the vertical guiding strip 54, cfr. Fig. 5. Now this strip 54 takes over the guiding of the guiding piece 32, and when this latter is moved away from the guiding member 62' the latter is swung back by the spring 68 against a stationary abutment 74 and is clear to take care of the guiding of the next mould frame.

In Fig. 9, which illustrates the manner of turning the mould frames through an arbitrary angle, is shown the front guiding piece 32A of the mould frame in full lines and the back guiding piece 32B of the same mould frame in dotted lines as viewed in the direction of the axis of rotation of the mould frame. The mould frame is moved by the conveyor belt in the direction of the arrow and the center of the guiding pieces moves along the dash and dot line shown.

In the path of the guiding piece 32A is mounted a stationary abutment in the form of a roller 76 rotatable on a pivot pin 78. When the guiding piece 32A abuts against the roller 76 and the mould frame and thus the said piece are further advanced in the direction of the arrow, the piece 32A is turned by a right angle to the position 32A<sup>1</sup> and at the same time the piece 32B is moved

to the position 32B<sup>1</sup>. In the position 32A<sup>1</sup> the guiding piece is guided by a guiding strip 80 to prevent over-turning. When the front guiding piece has been moved free from the strip 80 to the position 32A<sup>2</sup> the back guiding piece 32B occupies the position 32B<sup>2</sup>. Now this latter piece strikes a stationary abutment roller 82 arranged in its path and by the further movement of the conveyor belt the pieces 32A and 32B are turned by 90 degrees to the positions 32A<sup>3</sup> and 32B<sup>3</sup>, respectively. If by an abutment a less angle of rotation than 90 degrees is wished, the abutment is arranged further away from the path of the axis and if the mould frame is to be held in an intermediate position, the means shown in Fig. 6 can be used.

It will appear from the above description that by the conveyor mechanism described it is possible to retain the mould frames and the moulds in a certain angle position independent of the travel of the conveyor belt past pulleys and in horizontal and vertical directions and that furthermore it is possible to turn the frames and the moulds to any angle position practically required at any place of their travel.

It is preferred to let the axis of rotation of the mould frames pass approximately through the center of gravity of the combined mould and frame as then these two members will be substantially in equilibrium in all positions and then they can be turned and guided with less possible power and wear. The invention, however, is not restricted to this special arrangement or to the embodiment shown and described as various modifications may be introduced within the scope of the invention without departing from the spirit thereof as will be evident to those skilled in the art.

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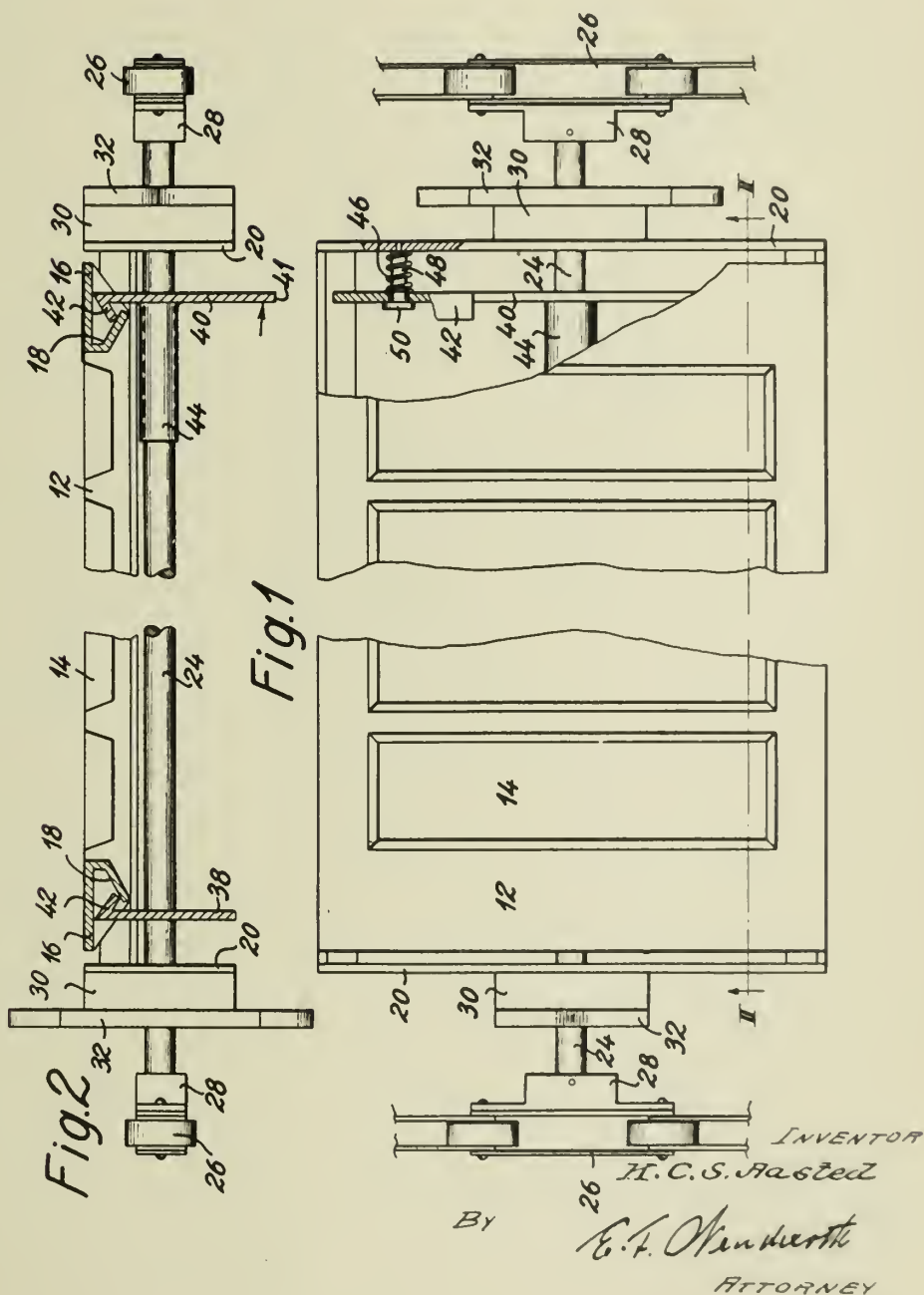
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4 Sheets-Sheet 2

Fig. 7

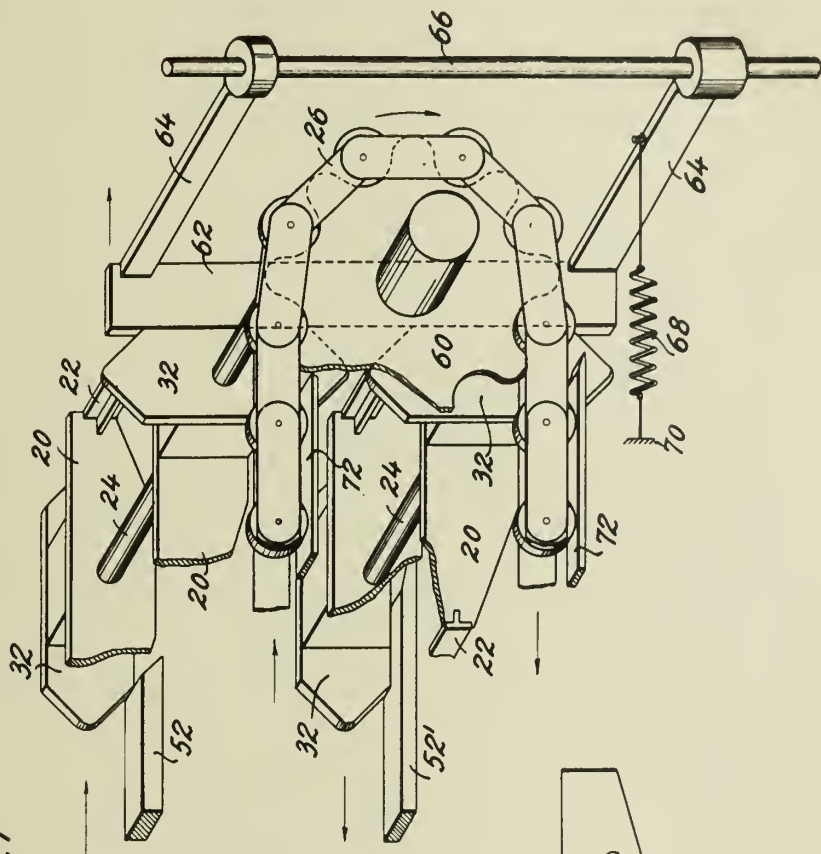
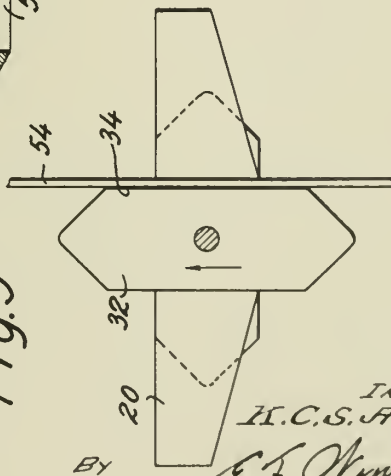


Fig. 5



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4 Sheets-Sheet 3

Fig. 8

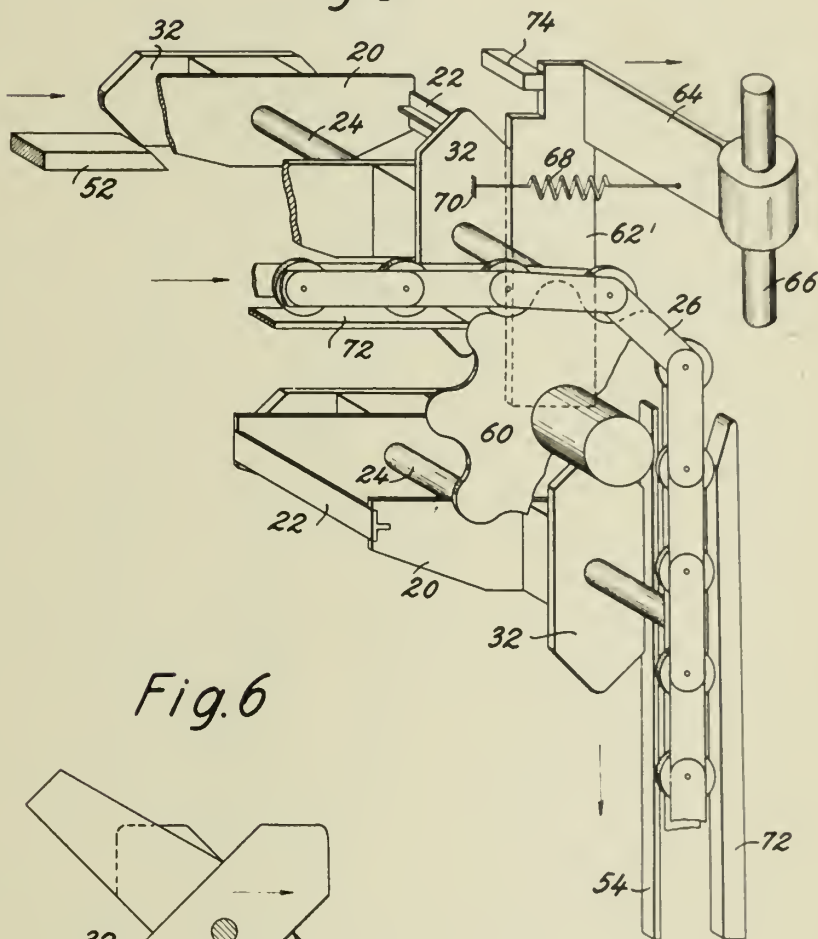
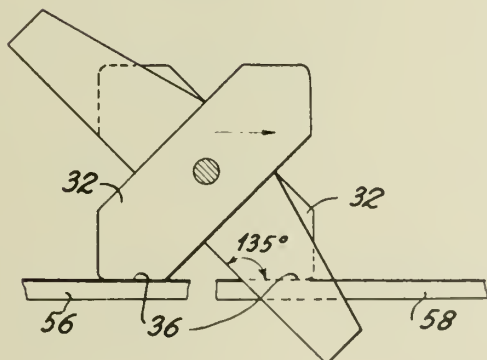


Fig. 6



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Fig.3

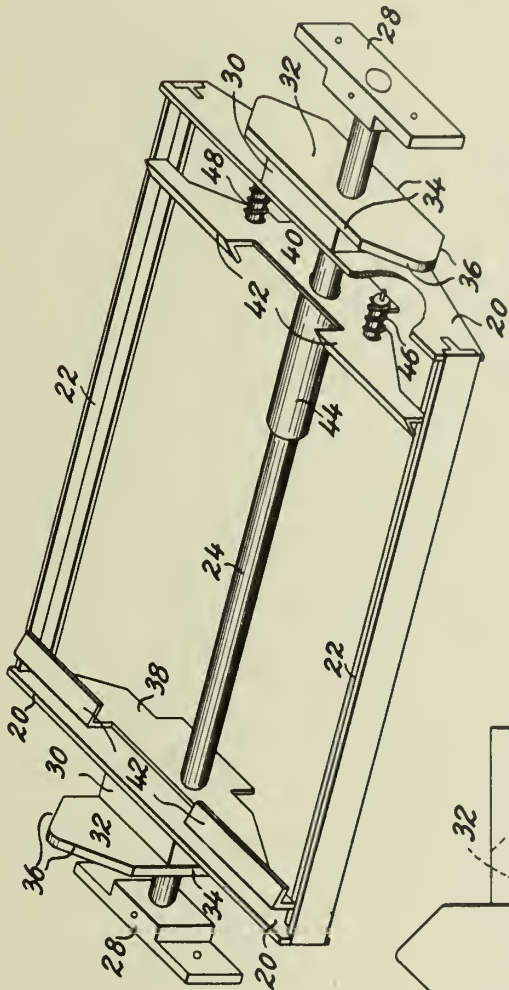


Fig.4

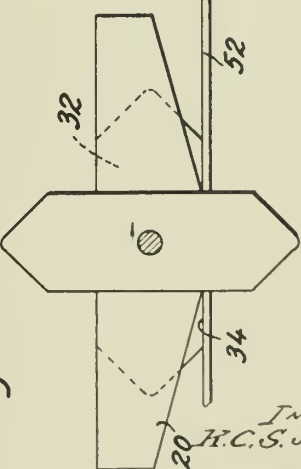
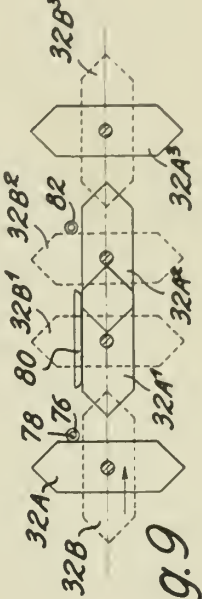


Fig.9



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ALIEN PROPERTY CUSTODIAN

CLAW COUPLINGS WITH SYNCHRONIZING  
DEVICE

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Bodensee, Germany; vested in the Alien Prop-  
erty Custodian

Application filed August 15, 1949

Our invention relates to claw couplings having synchronizing devices and has special reference to couplings of this kind as used in power and speed transmissions, for instance with change speed gears for motor cars and the like.

The main object of our invention is to prevent engagement of the two coupling halves to be engaged until both have come to substantially equal speed of rotation or as long as one half rotates while the other half stands still. The final engagement of both halves shall not be possible before they are synchronized.

There are other objects also connected with our invention which will be seen best when having reference to the drawings.

For our purpose we provide locking elements adapted to be moved by the torque for example radially with regard to the axis of the two coupling halves and which are in such connection with the synchronizing device that they prevent the claws of the coupling to engage while the synchronizing device acts. But as soon as this device has caused the two coupling halves to rotate at equal speed the locking elements are automatically removed so as to allow final engagement of the coupling claws which are under adequate tension exerted by means of a hand lever or the like.

The construction according to our invention is extremely simple and cheap as additional intermediate toothed elements which are made use of in known constructions for similar purposes are not necessary here. That is why our construction has the further great advantage of being much shorter in the direction of the axis of its shaft. Of special value is the fact that the coupling according to our invention may be operated easily in shortest time and without injurious shocks or the like.

All this will be understood best when having reference to the drawings which represent several examples embodying our invention.

The first example is shown in Figs. 1 to 4, inclusive, of which Fig. 1 is a longitudinal section through a claw coupling for speed transmission gears; Fig. 2 is a top view on the circumference of the coupling, seen in the direction of arrow 0 in Fig. 1; Fig. 3 is a portion of a vertical section at right angles to that of Fig. 1 taken along line III—III thereof and showing the locking elements in their idling position, whereas in Fig. 4 the same vertical section is represented but with the locking elements being in the locking position.

Fig. 5 is a longitudinal section through another

modification of a claw coupling for gears of speed transmission; and Fig. 6 represents a third modification, also in longitudinal section, equaling to that of Fig. 1 but including additional elements.

Fig. 7 is a diagrammatical view of a certain portion of the construction according to Fig. 6, as explained later.

Fig. 8 shows the same example as Fig. 1 but in double-acting construction.

As to the example represented in Figs. 1 to 4 the driving shaft is designated at 1. Connected thereto is gear 2 adapted to mesh by means of teeth 3 with some other gear (not represented). Gear 2 is journaled at 4 on the end 5 of driven shaft 6, and it has claws 7 adapted to engage with claws 8 of the shiftable member 9 which is in driving connection with member 10 splined to driven shaft 6. Furthermore, there is a friction cone 11 provided on gear 2 adapted to cooperate with ring friction cone 12 which is by its elasticity in driving connection with member 10 adapted to be shifted on shaft 6 by means of lever 13.

There is an elastic ring 14 situated in a circular groove 15 of member 10 which by its tension causes connection between members 9 and 10; but these members are again disconnected in axial direction as soon as the shifting force exerted on lever 13 overcomes the tension of ring 14 so that it is pressed inwardly into the inner portion of groove 15. Then member 9 is free to move further to the left thereby causing engagement of claws 8 with claws 7.

Thus, when engagement of the coupling is intended lever 13 is shifted to the left causing members 9 and 10 to follow such movement so that friction cone 12 is pressed against friction cone 11. Consequently the desired synchronizing effect between the two coupling halves is created. To prevent member 9 from further movement to the left which would cause teeth 8 to rattle past teeth 7 and possibly destroy them, there is a locking member, preferably a ball 16 or the like, situated in a bore 17 of member 10. Ring friction cone 12 is provided with a longitudinal notch 18 situated opposite bore 17 and having inclined side faces, so that ball 16 is pressed outward whenever member 12 tends to rotate inside of member 10 which will happen whenever member 2 rotates at a different speed than member 10 while both these members are tensioned against each other by shifting lever 13 to the left so that friction cone 11 slides on ring friction cone 12. As there is a further notch 19 provided in the tooth of member 9 and oppo-

site to bore 17 in member 10, but in transverse direction, locking ball 16 will under the above mentioned conditions be pressed into this notch and thereby prevent member 9 with its teeth 8 from being moved into contact with teeth 7 of member 2 (Fig. 4).

But as soon as by means of the friction cones 11 and 12 being pressed against each other members 2 and 10 were synchronized the tension between members 10 and 12 vanishes and locking ball 16 is no more pressed outward into notch 19 of member 9 (Fig. 3), so that now this latter member after having overcome the resistance offered by the elastic ring 14 is free to move to the left and to cause engagement between teeth 8 and teeth 7 thereby bringing the two coupling halves into final engagement avoiding every shock.

Of course, we prefer to provide not only one locking ball on member 10 but to distribute a plurality, for example three, over its circumference.

The example represented in Fig. 5 is substantially alike that of Figs. 1 to 4. Only member 100 has a little different shape than member 10, and some of the members are arranged differently. On movement of lever 13 to the left and friction cones 11 and 12 being pressed against each other, locking ball 16 will be pressed inwardly into notch 119 provided in shaft 6, so that member 100 is prevented from further movement to the left until the friction has caused synchronization so that now locking ball 16 may easily be shifted back to its outer position—as represented in Fig. 5—thus allowing for member 100 to move further and cause engagement between teeth 8 and 7 which means final engagement between gear 2 and shaft 6.

The third modification shown in Fig. 6 re-

sembles that of Fig. 1 but it includes in addition a laminated friction clutch inserted in gear 2 for the purpose of reducing the time and force necessary for the synchronization of the two elements to be coupled, namely the gear 2 and the shaft 6.

Friction cone 11 in contradistinction to the examples represented in Figs. 1 and 5 is not provided on the gear 2 itself but on a ring member 30 adapted to rotate with regard to gear 2 but held axially by means of elastic ring 31. At the left hand end of ring member 30 inclined teeth 32 are provided adapted to co-operate with inclined teeth 33 (Fig. 7) on the end disc 34 of friction clutch 35 inserted inside of gear 2.

When lever 13 is moved to the left friction cones 11 and 12 are again pressed against each other and ball 16 is moved outwardly by the inclined side of longitudinal notch 18 and pressed into transverse notch 19, thus preventing teeth 7 and 8 from engagement. The torque exerted on ring member 30 by means of inclined teeth 32 and 33 causes a pressure on friction clutch 35, as indicated by arrow 36 in Fig. 7. Consequently, the synchronization of members 2 and 6 before their final engagement will be reached at in a much shorter time period.

Fig. 8 is exactly alike Fig. 1, only a second gear 40 is shown in addition which may be coupled to shaft 6 alternately with gear 2 in exactly the same manner, only by moving lever 13 to the right instead of to the left.

We do not want to be limited to the details described or shown in the drawings, as many variations may be made use of without deviating from the scope of our invention.

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PUBLISHED

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Serial No.

MAY 18, 1943.

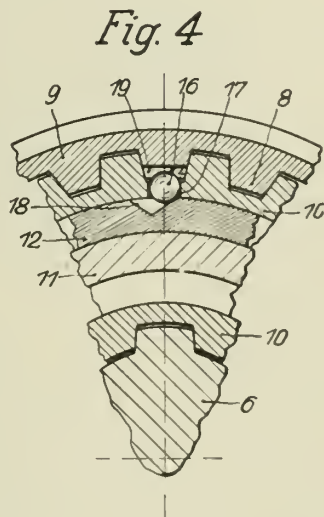
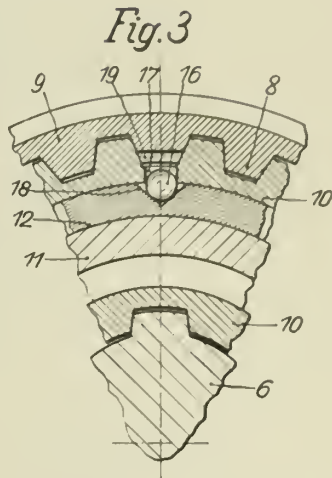
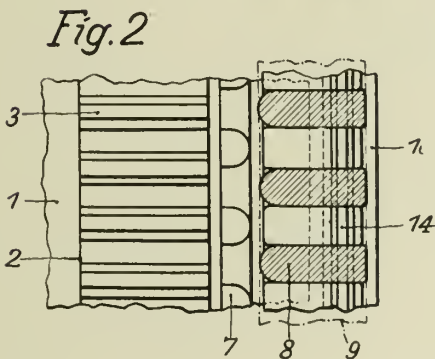
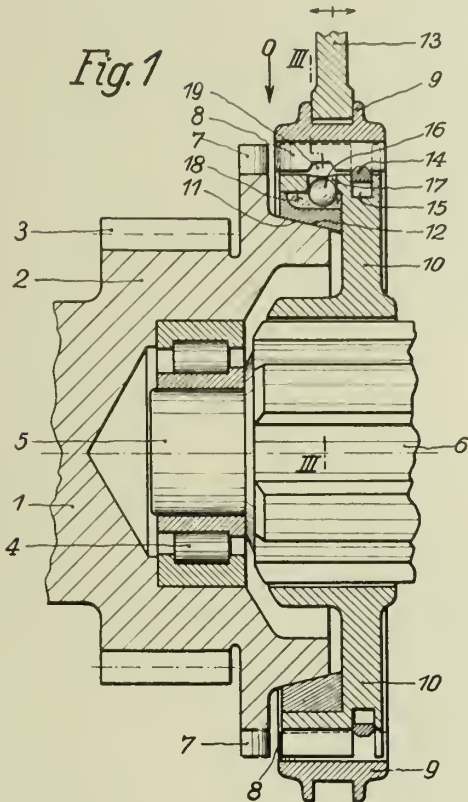
CLAW COUPLINGS WITH SYNCHRONIZING DEVICE

352,808

BY A. P. C.

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3 Sheets-Sheet 1



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3 Sheets-Sheet 2

Fig. 5

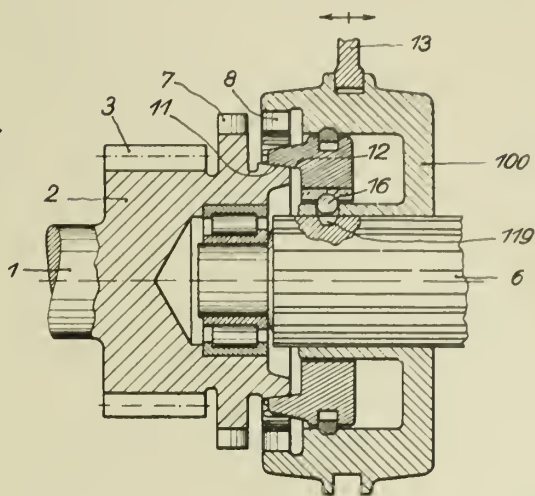


Fig. 6

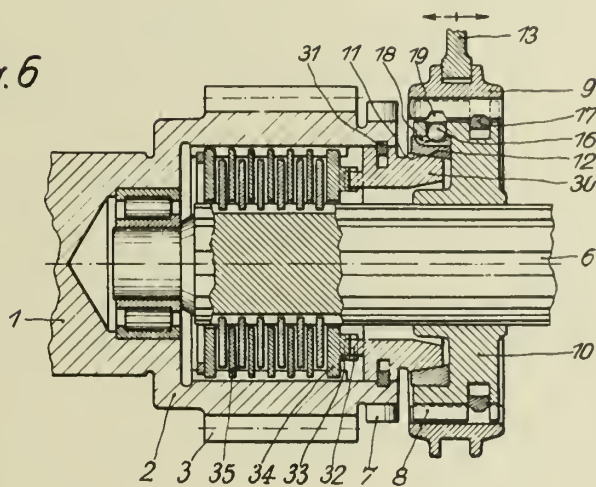
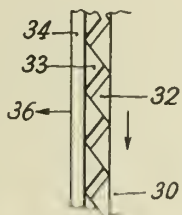


Fig. 7



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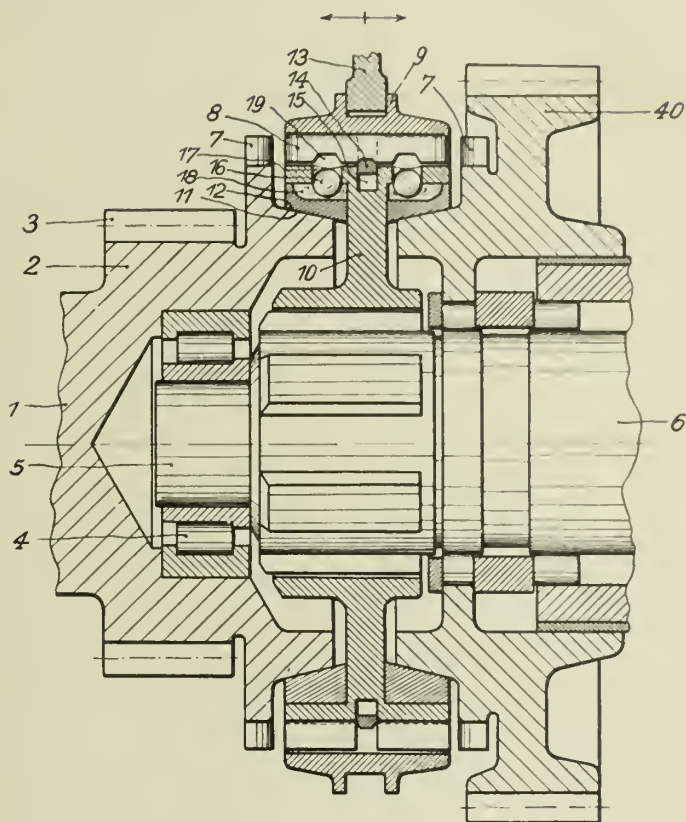
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Fig. 8



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ALIEN PROPERTY CUSTODIAN

VARIABLE RESISTORS

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In the copending application Serial No. —, filed —, are illustrated and described variable resistors in which an undue crowding of the current paths at one edge of the corresponding contact surface may be prevented in various ways. Another possibility of preventing such a crowding of the current paths consists according to the invention in subdividing the resistor in insulating layers or layers of high specific resistance, extending in the desired direction of the current paths.

In the accompanying drawings are shown by way of illustration some forms of the invention. in which

Fig. 1 shows a variable resistor consisting of a prismatic resistor  $w$  and a rectilinearly shiftable contact;

Fig. 2 shows a rotatable contact associated with two straight resistors, and

Fig. 3 shows a rotatable contact associated with two arcuate resistors.

According to Fig. 1, a contact  $s$  consisting preferably also of resistance material slides over a resistor  $w$ , the contact being subdivided (laminated) perpendicularly to the contact surface into insulating layers or resistance layers  $i$ . The insulating layers lie also perpendicularly to the direction of current in the resistor. The resistor  $w$  is provided at the side opposite to the contacts  $s$  with a current junction  $a$ . The distribution of the current paths extending within both bodies between the current junction  $a$  and the current junction  $b$  is substantially uniform so that the contact edge is prevented from being too heavily loaded.

Fig. 2 shows an arrangement in which an approximately uniform distribution of the current paths is obtained by a symmetrical arrangement of two resistors. The two resistors  $w_1$  and  $w_2$

are bridged by a laminated contact  $s$ , preferably of good conductivity, lying crosswise with respect to the two bodies. The ends of the contact upon rotation of the contact are moved away from the current junctions  $a_1$  and  $a_2$  so that a resistance increasing in value is inserted in the circuit. Owing to the symmetrical arrangement, the various current paths extending within the contact have substantially the same length so that a concentration of the current in certain paths is prevented and therefore a crowding of the current paths. The lamination of the contact supports a uniform current distribution.

An improved arrangement of the above character is shown in Fig. 3, in which the resistors  $w_1$  and  $w_2$  are arcuate, the contact surface covered by the contact  $s$  forming a cylindrical surface. The insulating pieces  $i_1$  and  $i_2$  are associated with the conducting central portion of the contact to form a cylindrical body. The current junctions  $a_1$  and  $a_2$  of the resistors  $w_1$  and  $w_2$  respectively are arranged on the cylindrical surface in the manner as shown in Fig. 3 and extend over a considerable portion of length of the resistors. The specific resistance of the resistors may vary in a similar manner as the specific resistance of the embodiment shown in Fig. 5 of the above copending application; however, also homogeneous resistors may be employed as shown in Fig. 2. The contact is laminated in the direction of the desired flow of current. Depending upon the position of the contact, the latter inserts in the circuit more or less resistance. In the position shown the connection is practically without resistance.

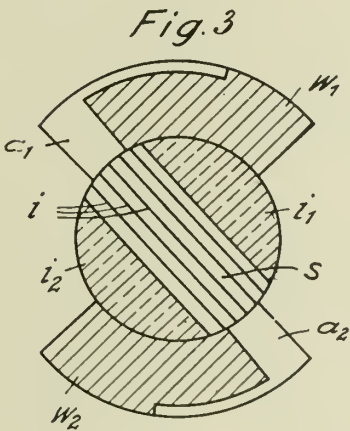
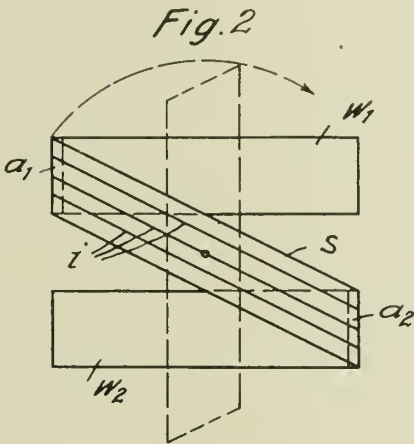
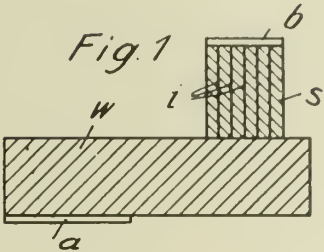
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VARIABLE RESISTORS  
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# ALIEN PROPERTY CUSTODIAN

## LEVELING THE CHARACTERISTIC OF PHOTOGRAPHIC EMULSIONS

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Application filed August 23, 1940

When taking sound records in half-wave-intensity records (push-pull-class B records) in which, as is well known, the working point lies at the lower end of the photographic characteristic, the obtainable resting transparency is limited by the downward curvature of the photographic characteristic and, therefore, for the purpose of obtaining a sufficiently large reduction of the interference or noise level, renders necessary the use of the push-pull-class AB or the push-pull-class A method in which the resting transparency lies above the curvature of the photographic characteristic. Hitherto in making half-wave-intensity records, using the so-called sag as well as the so-called straight or direct method, resting transparencies were obtained which at the best amounted to about a fifth to an eighth of the maximum resting transparency. Due to the gradation determined by the image, the photographic starting characteristic of the positive cannot be influenced. With the use of photographic means the photographic starting slope of the negative cannot substantially be increased beyond the hitherto obtainable degree. To ensure the reduction of the interference or noise level and the volume of sound of the half-wave-transverse records, it would be necessary to realize an infinite or even a negative slope of the starting characteristic in the negative.

According to the present invention a practically linear transfer characteristic with a resting transparency of any desired magnitude and with any desired reduction of the interference or noise level is obtained for half-wave-intensity records by using for making records a divided Kerr-cell having two pairs of plates and supplying an additional voltage, depending on the amplitude, to each of the pairs of plates besides the resting voltage and the corresponding half-wave voltage. This additional voltage decreases in proportion to the increase of the amplitude of the half-wave voltage. The additional voltage is so chosen that the product of the slope of the characteristic of the electric transfer device and the photographic blackening characteristic has a constant value for each amplitude.

In this manner, for instance, a sound record according to the Kerr-cell method is made in such a manner that an ordinary Kerr-cell is divided and each of the pairs of plates of the double Kerr-cell is supplied with the resting voltage as well as the corresponding half-wave voltage and, moreover, during operation on the non-linear portion of the photographic Kerr-cell characteristic, is supplied with an additional volt-

age which in proportion to the voltage applied is the larger the smaller the slope of the photographic characteristic is.

An additional voltage satisfying this requirement is produced according to a further feature of the invention by supplying a portion of the half-wave voltages applied to the pairs of plates to the control grids of an electron tube having an exponential characteristic and by adding to the two half-wave voltages the voltages, occurring at the anode resistances.

Preferably the control circuits of the two Kerr-cells are so formed that the source of the half-wave voltage, serving simultaneously for controlling the exponential tube, the anode voltage, serving as resting voltage for the Kerr-cells, and the anode resistances are connected in series with a pair of plates of the double Kerr-cell.

In the accompanying drawing one arrangement according to the present invention is diagrammatically shown by way of example.

The two half-wave voltages derived from a rectifier are applied to the resistances 6 and 7 between the points 1 and 2 and 2 and 3 respectively. The resistances 6 and 7 respectively are connected in series with the resting voltage 16 of the Kerr-cell, the resistances 14 and 15 at which the additional voltages are produced, and the pairs of plates 10, 4 and 11, 5 of the Kerr-cell 17 which electrically are independent on each other. A portion of the half-wave voltages applied to the resistances 6 and 7 respectively is supplied to the control grid of exponential tubes 8 and 9 respectively. The resting voltage 16 of the Kerr-cell simultaneously serves as anode voltage for the push-pull-connected tubes 8 and 9. The resistances 14 and 15 respectively, arranged in the control circuits of the two pairs of plates of the Kerr-cell, form the anode resistances of the two tubes 8 and 9. The voltages occurring at the anode resistances 14 and 15 are added to the voltages applied to the resistances 6 and 7 and form the additional voltages necessary for compensating the curvature of the photographic starting characteristic if the plates 10 and 11 of the Kerr-cell 17 are connected to the points 12 and 13 respectively.

The half-wave voltages must be so connected to the resistances 6 and 7 that the negative poles lie at the points 1 and 3. Each half-wave then produces a negative voltage impulse at the control grid of the corresponding exponential tube. Due to the logarithmic course of the tube characteristic the anode current is not proportional to the half-wave amplitude applied to the control

grid, but on an increase of the half-wave amplitude the increase of the anode current becomes smaller and smaller. Starting from a certain half-wave amplitude the anode current no longer increases so that the additional voltage cannot exceed a certain highest value. In other words this means that with an increasing amplitude of the half-wave voltage the additional voltage decreases in proportion to this increasing amplitude.

For carrying out the above described method a Kerr-cell having four electrically independent plates is required. Empirically the exact and reliable manufacture of such Kerr-cells having four individual plates is very difficult.

When making records considerable difficulties are encountered by the fact that the plates of the usual Kerr-cells tend to vibrate under the influence of the electric alternating fields, whereby the production of a record free of objections is prevented. It is necessary that the two electrodes always are arranged in exactly the same plane and are spaced from each other in exactly equal distances. Moreover, the gaps formed by the electrodes must be absolutely parallel. These requirements, however, cannot be fulfilled with the hitherto known kind of electrodes. With the known electrodes, consisting of metal plates and metal blocks, the required precision cannot be obtained.

According to a further feature of the present invention, the Kerr-cell for carrying out the above described method is so constructed that the two pairs of electrodes are formed of two

glass- and porcelain plates ground in plane parallel which are separated from each other by insulating distance pieces arranged in plane parallel fashion the surfaces of which facing each other are, by known methods, provided with thin metal layers which in the middle of the plates are separated from each other in the form of a narrow line.

Practically the electrodes of the Kerr-cells are made in such a manner, that two long, rectangular glass- and porcelain plates ground in plane parallel are provided, by methods known per se, for instance by cathode atomising, galvanisation etc. each on one side with a thin metal layer. In the middle of the plates these metal layers are then removed in a narrow line in parallel to the shorter edge of the plate so that two metal layers, electrically separated from each other, are arranged side by side upon each plate which form the electrodes of the Kerr-cells. The two plates then are mounted in the Kerr-cell with the metal layers facing each other and maintained in the proper distance from each other by plane parallel insulating distance pieces.

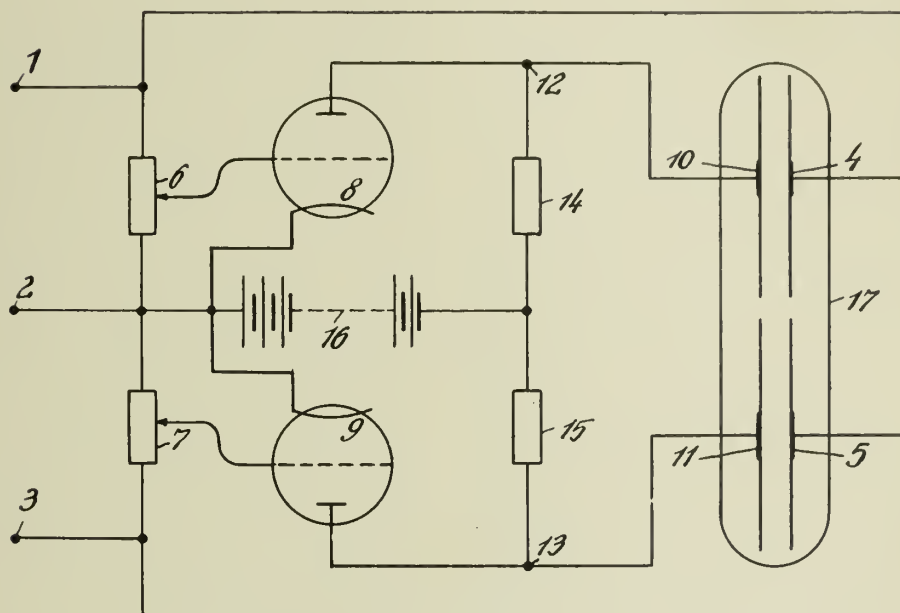
Such double Kerr-cells have the advantage that the plates of the two pairs of plates positively have equal distance from each other so that in electrical respect the two pairs of plates are equivalent with an exactness as great as possible. A further advantage is the large mechanical strength of the plates so that movement of same during operation is impossible.

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# ALIEN PROPERTY CUSTODIAN

## PRODUCING SOUND RECORDS IN HALF-WAVE RECORDS

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Application filed August 27, 1940

The present invention relates to connections for the production of half-waves derived from the currents of sound frequency microphones such as are required for making sound records in half-wave records (so-called push-pull class B records). By these connections the disturbances and distortions are to be prevented or removed which occur with the known connections when an alternating current and an alternating voltage respectively is divided into two half-wave trains.

Fig. 1 shows the known connection for producing half-waves. Applied to the resistance 1, arranged between the grid and the cathode of an amplifier tube 2, are the eventually previously amplified microphone currents and voltages respectively. In the anode circuit of the tube 2 the primary winding 4 of the push-pull transformer 3 is arranged. Symmetrically connected in series with the secondary windings 5 and 6 is a diode 7 and 8 respectively and a resistance 9 and 10 respectively. As the diodes allow current to pass in one direction only, current may flow in each of the circuits 5, 7, 9 and 6, 8, 10 respectively in one direction only due to the diodes 7 and 8 being connected in opposite sense. Therefore, voltage drops in the one direction only occur at the resistance 9 and in the other direction at the resistance 10. The half-wave voltages tapped at 9 and 10 may then be supplied to the record member.

Now, it has been found that this connection does not allow the production of sound records in half-wave records free of objections for the following reasons: At each reversal of the current flow in the transformer 3 the diodes 7 and 8 effect a connection in such a manner that always one of the push-pull circuits is cut in and the other cut out. As substantial powers are required for the operation of the recording members considerable current intensities must be switched. The windings 5 and 6 are alternately short-circuited and opened by way of a relatively small resistance. The same conditions then occur as with the opening and closing of a circuit in which a self-induction is arranged. The voltages occurring by these connections in the self-induction cause disturbances in the corresponding push-pull circuit itself as well as in the other push-pull circuit due to reactive effects by way of the transformer 3. These disturbances particularly also those due to the reactive effect mentioned above cause such strong distortions in the sound record as to render same useless.

Now, according to the invention connections

are described which prevent the above mentioned disturbances and allow a production of half-waves free of objections.

In the accompanying drawings some electrical connections according to the invention are diagrammatically shown by way of example in Figures 2 to 6 inclusive.

The arrangement shown in Fig. 2, illustrating electric balancing, starts from the principle of preventing the opening and closing of the windings 5 and 6 of the transformer 3 by which the disturbances are caused. This is obtained in an exact manner by the fact, that a second circuit, consisting of the diode 7' (and 8' respectively) and the resistance 9' (and 10' respectively), is connected in parallel to each of the two push-pull windings besides the circuit, consisting of the diode 7 (and 8 respectively) and the resistance 9 (and 10 respectively). As far as the electric dates are concerned, the resistances and diodes of the two circuits connected in parallel exactly correspond to each other and the two diodes 7 and 7' (or 8 and 8' respectively) are so connected as to allow current to pass in opposite directions. This connection ensures that an opening and closing of the circuits imposed upon the windings 5 and 6 does no longer occur and the transformer acts in the same manner as an ordinary push-pull transformer. The two half-wave voltages are tapped at the resistances 9 and 10. Of course, the half-wave voltages produced at the resistance 9 and 10 also may be supplied to the recording members.

Another arrangement for producing half-waves free of objections in accordance with the invention is shown in Fig. 3. As empiracally the largest proportion of the distortions is effected by the opening- and closing voltage of one push-pull winding acting upon the other push-pull winding by way of the transformer 3, two single-cadence transformers 3 and 3', supplied by two tubes 2 and 2' connected in parallel at the input side, are used according to the invention instead of the push-pull transformer. Between the grid and the cathode of the tubes 2 and 2' the eventually previously amplified microphone voltages are applied. Connected to the anode circuits of the tubes are the primary windings 4 and 4' of the transformers 3 and 3' respectively. In the manner shown in the drawing the secondary windings 5 and 6 are connected to the circuits consisting of the rectifier and resistance. The circuits connected to the windings 5 and 6 can no longer mutually influence, but at the best react upon the anode circuit of the corresponding

tube 2 and 2' respectively. Such a reaction, however, is intercepted by the anode circuit and practically remains of no importance.

Finally a further modification allowing suppression of the disturbances caused by the effect of the connection of the diodes is shown in Fig. 4. As the degree of reaction of the two diode circuits of Fig. 1 upon each other depends on the intensity of the currents flowing in the circuits, the tendency prevails to maintain these currents as small as possible. However, as a considerable power is required for controlling the recording members connected to the resistances 9 and 10, these currents cannot be chosen as large as desired. Now, in accordance with the present invention very high ohmic values are chosen for the resistances 9 and 10 so that a disintegration into half-waves of the eventually previously amplified microphone currents applied to the primary winding of the push-pull transformer 3 (Fig. 4) practically remains without effect and no substantial currents flow through the windings 5 and 6. Due to the high values of the resistances 9 and 10 the half-wave voltages occurring at these resistances, are not adapted for controlling the recording members but are used to control the power amplifying tubes 11 and 12. The voltages occurring at the anode resistances 13 and 14 are then supplied to the recording members.

As the characteristics of the diodes do not pass through the zero point, but have a starting characteristic extending into the negative voltage field, no half-wave record but a push-pull class A or class AB record) is obtained with the described connections operating at small amplitudes.

This defect of the connections above described is avoided according to the present invention by inserting in each of the diode circuits an adjustable negative counter voltage which is chosen so large that the effective operating characteristic of the diode passes through the zero point.

Fig. 5 shows such a connection. Applied to the primary winding 4 of the push-pull transformer 3 are the speech currents to be recorded, symmetrically connected in series with the push-pull windings 5 and 6 is a diode 7 and 8 respectively and a resistance 9 and 10 respectively. As the diodes allow current to pass in one direction only, current may flow in the circuits 5, 7, 9 and 6, 8, 10 respectively in one direction only due to the diodes 7 and 8 being connected in opposite sense. Therefore, at the resistance 9 voltage drops only occur in the one direction. The half-wave voltages tapped at the resistances 9 and 10 are then supplied to the recording members.

As a matter of fact the diodes, however, do not allow current to pass in one direction only, but small amplitudes are also allowed to pass in the opposite direction. For the purpose of avoiding this undesired effect a variable counter voltage is applied between the connecting point of the resistances 9 and 10 and the common point of the push-pull windings 5 and 6. Preferably

the common point of the push-pull windings 5 and 6 is arranged at the wiper of the potentiometer 15 to the ends of which the voltage source 16 is applied as indicated in the drawing. The potentiometer 15 then is so adjusted that the effective operating characteristic of the diodes 7 and 8 passes through the zero point. Hereby the diodes really allow current to pass in one direction only.

In making records it is absolutely necessary either to permanently or temporarily supervise the half-wave voltages serving to control the recording members. This is effected by composing the two half-waves to a complete curve again and eventually supplying same by way of an amplifier, to a control member, for instance a Braun tube, a loudspeaker etc. This composition may be effected in a particularly simple manner by employing for making records the above described connections in which two circuits are applied in parallel to each of the push-pull windings of the transformer serving to produce the half-waves and in which the rectifiers in these circuits allow current to pass in opposite directions.

This connection shall now be explained by way of Fig. 6. Applied to the primary winding 4 of the push-pull transformer 3 are the speech currents. In the manner described already two circuits are applied to each of the push-pull windings 5 and 6. The recording members are supplied with the half-waves occurring either at the resistances 9 and 10 or at the resistances 17 and 18. Now, for a listening control, portions of the half-wave voltages occurring at the resistances 9 and 10 are supplied to the amplifier tubes 19 and 20 respectively arranged in push-pull fashion. Now, in composing the amplified half-waves in the push-pull transformer 21 the above mentioned disturbances would occur. However, as half-wave voltages occur at the resistances 17 and 18 respectively which are displaced in time and direction about 180° from the half-wave voltages occurring at the resistances 9 and 10 respectively, the half-wave voltages applied to the grids of the tubes 19 and 20 may be completed to a total wave in a simple manner by the fact that by way of a condenser 22 a partial voltage in a corresponding magnitude is tapped at the resistances 17 and 18 respectively also and is added to the voltage tapped at 9 and 10 respectively. Complete curves, therefore, are applied to the grids of the tubes 19 and 20, which operate in the same manner as an ordinary push-pull class A stage so that switching impulses no longer occur in the transformer. To avoid phase defects attention is to be directed to the fact that the four coupling condensers 22 which also may be omitted correspond to each other as the resistances 9, 10, 17 and 18 had to be balanced exactly to each other for the production of the half-waves. The voltage occurring at the secondary winding of the transformer 21 is supplied to the control member.

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Filed Aug. 27, 1940

2 Sheets-Sheet 1

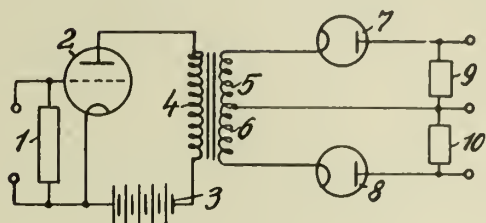


Fig. 1

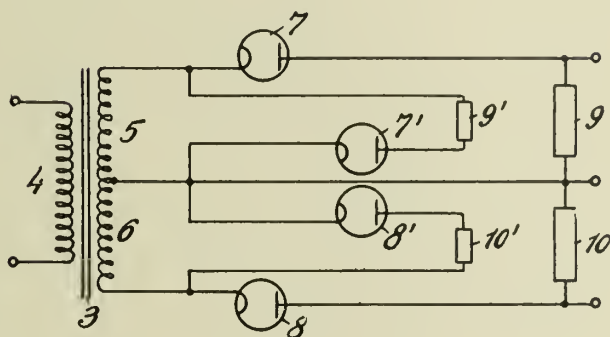


Fig. 2

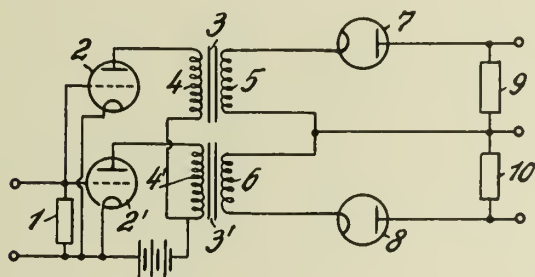


Fig. 3

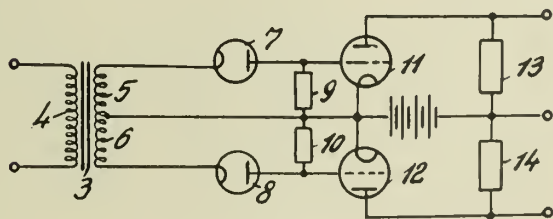


Fig. 4

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By *Stewart Davis*  
Att'y.



PUBLISHED

C. BECKER

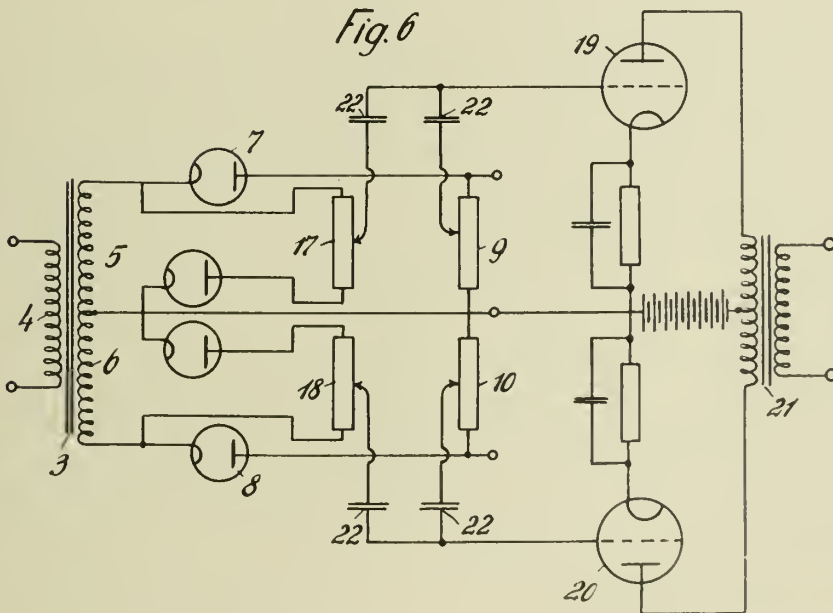
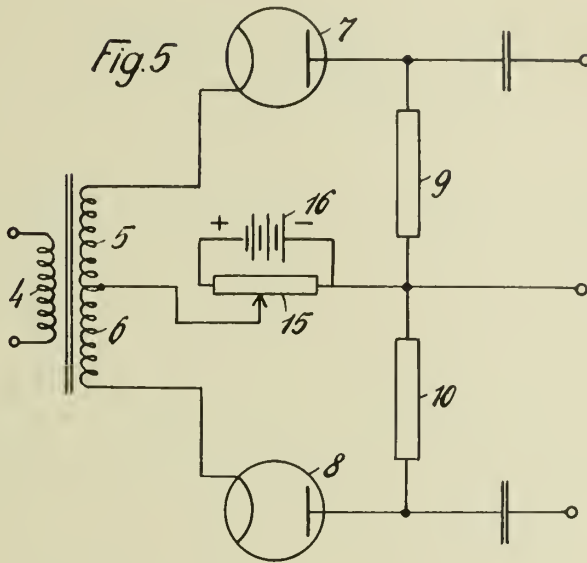
Serial No.

MAY 18, 1943. PRODUCING SOUND RECORDS IN HALF-WAVE RECORDS 354,459

BY A. P. C.

Filed Aug. 27, 1940

2 Sheets-Sheet 2



*Inventor:*

*C. Becker*  
*By: [Signature] & [Signature]*  
*Attys.*



ALIEN PROPERTY CUSTODIAN

METHOD OF MANUFACTURING HOLLOW PROPELLER BLADE FOR AIRCRAFT

Yutaka Sakamoto, Shizuoka-ken, Japan; vested in the Alien Property Custodian

Application filed August 28, 1940

This invention relates to the manufacture of hollow propellers for aircraft and has for its object to provide a new method of simply and easily manufacturing a light and tough hollow propeller blade for aircraft.

The invention essentially consists in preparing a suitably reduced prototype of a propeller blade as desired with a thermally melting solid material, such as paraffin and lead, coating the prototype with a suitable material enabling it to be plated, such as graphite, plating on the surface of the coated prototype with a suitable hard metal, such as nickel or iron, and melting and removing the prototype by heating to melt the material of the prototype, without melting the plated metal.

The invention will be further described with reference to the accompanying drawings in which:

Fig. 1 is a front view of a propeller blade manufactured in accordance with the invention;

Fig. 2 is a cross sectional view in an enlarged scale taken on the line II—II of Fig. 1, but with a prototype used in the manufacture;

Fig. 3 is a view similar to Fig. 2, but with a wire-netting on the prototype;

Fig. 4 is a perspective view of a metal frame adapted to cover the prototype;

Figs. 5 and 6 are fragmentary perspective and sectional views to show struts provided in addition in the embodiments as shown in Figs. 2 and 3 respectively; and

Fig. 7 is a perspective view to show struts provided in addition to the metal frame as shown in Fig. 4.

Referring now to the drawings, 1 represents a propeller blade manufactured in accordance with the invention. In the manufacture, first a prototype of the blade is formed in a suitably

smaller size than the blade by any suitable thermally melting material of a low melting point, such as paraffin or lead, as indicated in the dash and dot line at 2 in Fig. 1. The prototype is shown in cross sectional view in an enlarged scale in Fig. 2.

The prototype 2 is coated with a suitable material enabling it to be plated, such as graphite, as indicated at 3 in Fig. 2, and then it is plated in a plating bath (not shown) with a suitable hard metal, such as nickel or iron, as indicated at 4 in Figs. 1 and 2. After the completion of the plating, the prototype is melted by heating at a sufficient temperature to melt the material of the prototype, but not to melt the plated metal, and is removed through one end 5 of the plated metal, whereby a hollow propeller blade is obtained. The blade may be tempered, if desired.

For the reinforcement of the blade and the facility of the plating, the prototype coated with the material enabling it to be plated may be further covered with a wire-netting of bronze, steel, or other suitable material, as indicated at 6 in Fig. 3. A metal frame 7 shown in Fig. 4 may also be used instead of the wire-netting. In the embodiments shown Figs. 2 and 3, cross and transverse struts 8 and 9 may be embodied in the blade, by previously embedding in the prototype, as shown in Figs. 5 and 6 respectively. Further the cross and transverse struts 8 and 9 may be additionally embodied in the metal frame 7 shown in Fig. 4, as shown in Fig. 7.

Although I have shown and described specific embodiments of the invention, it will be understood that modification and changes may be made without departing from the spirit and scope of the invention.

YUTAKA SAKAMOTO.



PUBLISHED

MAY 18, 1943.

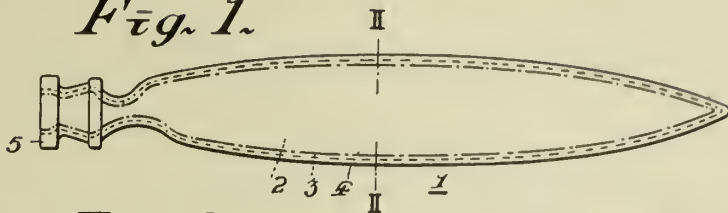
BY A. P. C.

Y. SAKAMOTO  
METHOD OF MANUFACTURING HOLLOW PROPELLER  
BLADE FOR AIRCRAFT  
Filed Aug. 28, 1940

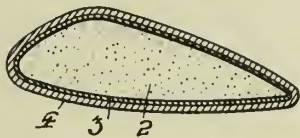
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354,622

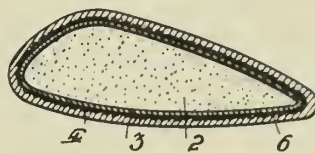
*Fig. 1.*



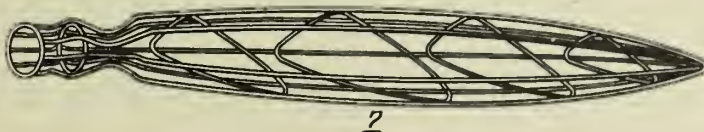
*Fig. 2.*



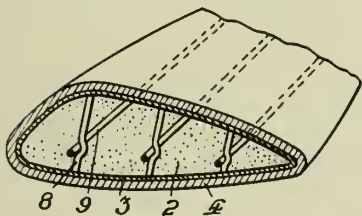
*Fig. 3.*



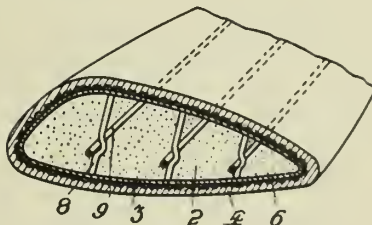
*Fig. 4.*



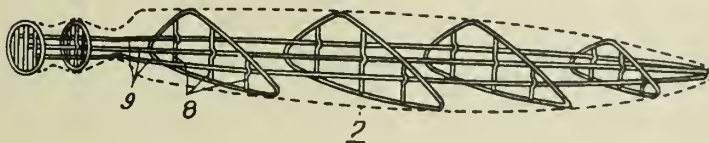
*Fig. 5.*



*Fig. 6.*



*Fig. 7.*



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# ALIEN PROPERTY CUSTODIAN

## LIGHT MODULATING SCREEN

Hans Werner Pachr, Berlin-Zehlendorf, Germany; vested in the Alien Property Custodian

Application filed August 29, 1940

This invention relates to a light modulating screen, particularly to a screen for television use which allows modulation of the spatial intensity distribution of a local light source of constant intensity, and is a refiling of application Serial No. 209,931 filed May 25, 1938.

Screens of this type are known in the art, particularly such screens which make use of a multitude of so-called flippers, which actuate light valves or change the optical path of the light in accordance with picture signals. These screens are extremely difficult to produce and are sluggish in operation.

It is the object of this invention to provide a new screen which can be readily produced without difficulty; to provide a screen which is not sluggish; to provide a screen which may be directly viewed or projected in an enlarged scale; and to provide a screen rendering a brilliant image of high definition. Other advantages may be seen from the following description of the invention.

Considered broadly, the screen according to this invention consists of a deformable surface capable of varying the optical path of light through the screen, when deformed, and a matrix. This matrix may consist of a screen whose openings are smaller than or equal to the size of a picture element. Means are provided to press individual regions of the matrix against the deformable surface, or alternatively to press individual regions of the deformable surface against the matrix, in accordance with the incoming picture signals, resulting in a deformation of the deformable surface compared with its position when no picture signals are received. The matrix in effect divides the deformable surface into a multitude of individual picture elements. There is also provided a local light source of constant high intensity, whose light is directed upon the deformable surface. The degree of deformation of individual regions of the surface is used to alter the path of incident light rays. This in turn results in a modulation of the spatial distribution of light intensity. To this end, the deformation of the deformable surface may be used to alter the optical path of light through the screen in two different ways. First, deformation of the surface, if it is reflecting, can be used to alter the angle of incidence and thereby also the angle of reflection of light directed upon the surface. Secondly, deformation of the surface, if it is that of a transparent medium possessing a certain predetermined refractive index, can be

used to alter the angle of refraction to which light passing through the screen is subjected.

The outgoing light stream, thus modulated in its spatial intensity distribution, can be directed upon a screen of ground glass, thereupon producing an image, or may be gathered in a projection lens and projected in an enlarged scale upon a viewing screen.

In order to explain the nature of this invention in detail, several embodiments are shown in the drawings, where Figures 1 to 5 are fragmentary diagrammatic cross-sectional views of screens embodying the present invention.

Referring to Figure 1, there is shown a matrix 1, which may consist of a screen of any suitable material. The flat portion of the bottom wall of a cathode ray tube is indicated by 2, and the vertical arrow touching wall 2 from the bottom illustrates the cathode ray beam which is modulated by incoming picture signals and scanned across wall 2. The deformable surface 3 may consist of a thin metal foil which is spaced from wall 2 by matrix 1. The cathode ray beam produces local charges on wall 2, according to its intensity. Individual regions of the deformable surface 3 will then be attracted toward wall 2 by virtue of and to an extent corresponding to the magnitude of the local charges. If a beam of light is incident upon a portion of surface 3 which has not been deformed but has remained flat, it will be entirely reflected in a new direction. If the region of surface 3 upon which the beam is incident has been deformed and shows a curvature of the surface, the incident beam will be reflected in various directions, that is, it will be dispersed. Thus, if the screen is observed from the direction of the emanating light rays themselves, the screen will appear bright at spots where the surface has remained flat; spots which have been more or less curved will appear less brilliant, according to the degree of curvature. This distribution of brightness, representing the new image, may be directly viewed or projected upon a screen by means of a lens system.

Figure 2 shows a modification of the above embodiment. Again 2 may be the flat portion of the bottom wall of a cathode ray tube, which is scanned by the modulated cathode ray beam indicated by the vertical arrow. Spaced from wall 2 is the matrix 1, upon which a thin metal foil 3 may be attached in a suitable manner. Light from a constant source is directed through a latticework 4 upon foil 3 so that it is incident only upon certain portions of the individual regions of the deformable surface. If the ele-

mental regions of the surface are deformed, the angle of reflection of the incident light will be changed. A second latticework 5, which is identical with latticework 4, is located in the path of the reflected light. If the reflecting surface is not deformed at all, the reflected light beams impinge on the solid portions of latticework 5 so that no light will go through the latter. If individual regions of the reflecting surface are deformed, this will to a certain degree change the angle of reflection and a certain portion of the light reflected by such an individual region will be allowed to pass through an opening in latticework 5. The variation in angle of reflection, and thereby the amount of light passing through an opening in latticework 5, can thus be varied in accordance with incoming picture signals. It is, of course, also possible to allow all light to pass through latticework 5 when the surface is not deformed and to blank out portions thereof with increasing deformation.

A modification in the construction of the screen is possible inasmuch as the thin foil 3 can be spot-welded along lines or at certain points to a base plate, thus eliminating matrix 1. Alternatively, it is possible to combine matrix 1 and wall 2 into one unit, as may readily be seen.

The charges conveyed to wall 2 can be neutralized by giving a certain amount of conductivity to this wall, or neutralization can be accomplished by a second cathode ray beam which scans wall 2 simultaneously with the charging cathode ray beam but leading the latter.

Figure 3 shows another embodiment of this invention. A liquid 3 is disposed in a glass container possessing two plane walls 6 and 7. A screen-shaped matrix 8 is in contact with the liquid. Wall 6 constitutes the flat bottom of a cathode ray tube, scanned by the modulated cathode ray beam illustrated by the vertical arrow from the top. The cathode ray beam conveys charges to wall 6 in accordance with incoming picture signals. For conditions of no charges on wall 6, the liquid does not touch glass wall 6. However, if charges are conveyed to glass wall 6, the liquid, which may be conductive and held at a definite potential, is attracted towards glass wall 6. The attracting force is proportional to the charge, and thereby the area of contact between liquid and glass wall will correspond to the magnitude of the charge. In this case, parallel light rays from a constant source are directed upon the screen. In such spots where liquid 9 is in contact with wall 6, the beam passes through the screen unimpeded. In regions, however, where no contact exists, and where wall 6 and the surface of liquid 9 are spaced from each other, incident light beams will suffer total reflection. Water, for instance, can be used as the required liquid. If the refractive indices of wall 6 and liquid 9 are identical, permeating light rays will not suffer any deflection.

As it is necessary in this case that the light from the constant source be incident upon wall 6 under a constant angle, parallel light rays are preferably used, and the upper surface of wall 6, as well as the bottom surface of wall 7, is provided with grooves so that the incident and emanating light rays form an angle of 90 degrees with the respective surfaces. In order to avoid wetting of wall 6 by liquid 9, it may be preferable to prevent this by providing the inner surface of wall 6 with a film of oil, or to take any other measure to this end.

Figure 4 is a further embodiment of the invention. In Figure 4 a matrix 10 is again located between two plane walls 11 and 12. The wall 11 is the flat portion of the bottom of a cathode ray tube, scanned by the modulated cathode ray beam illustrated by the vertical arrow from above. Matrix 10 is in close contact with wall 12, and each of its apertures contains a droplet of mercury 13. When the screen is not being actuated, these droplets rest upon wall 12. When, however, the cathode ray beam conveys local charges to wall 11, these droplets are attracted towards wall 11 thereby, so that they press themselves against this wall, whereby the area of contact corresponds with the magnitude of the individual local charge. Light rays incident upon wall 11 are reflected from regions where mercury droplets are in contact with wall 11. The amount of light reflected is proportional to the area of contact.

Figure 5 is a further embodiment of the invention, and represents a modification of that shown in Figure 4. In this case, the screen contains a continuous layer of mercury 14 instead of individual droplets. Matrix 8 is closely adjacent to wall 11. The mode of operation is essentially the same as described in connection with Figure 4.

In the cases of Figures 4 and 5, it may be preferable to fill the space between walls 11 and 12, which is not taken up by the mercury and the matrix, with an electrically isolating liquid of substantially the same refractive index as that of wall 11. This may be done in order to avoid adhesion of the mercury droplets to the wall, and to decrease the reflection from the lower surface of wall 11. Preferably, a liquid of low density is used.

From the foregoing it may be seen that the use of separate members for defining picture elements and for light modulation has inherent advantages over other screens known in the prior art.

While I have described embodiments of my invention using a separate screen-like member, referred to as the matrix, I do not limit myself to this particular embodiment.

HANS WERNER PAEHR.

PUBLISHED  
MAY 18, 1943.  
BY A. P. C.

H. W. PAEHR  
LIGHT MODULATING SCREEN  
Filed Aug. 29, 1940

Serial No.  
354,771

FIG. 1

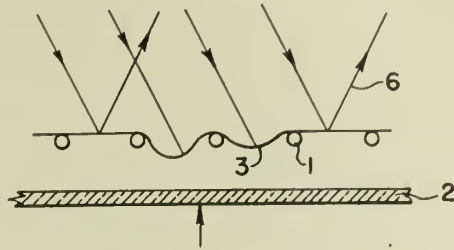


FIG. 2

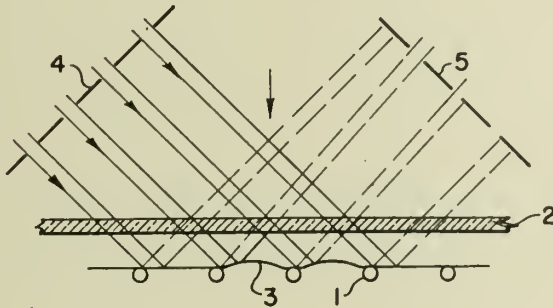


FIG. 3

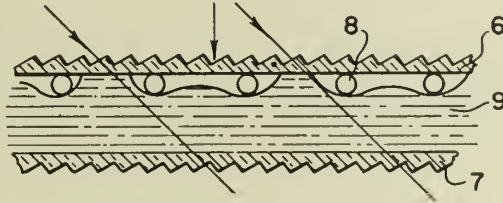


FIG. 4

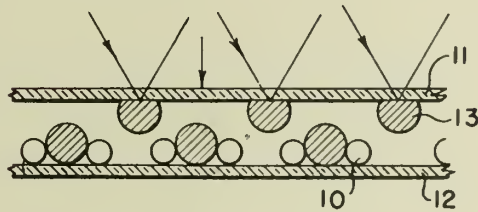
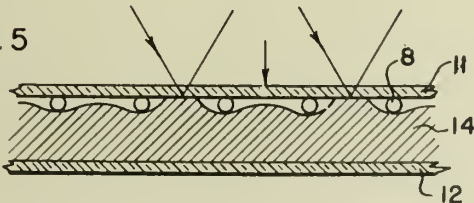


FIG. 5



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ALIEN PROPERTY CUSTODIAN

VARIABLE RESISTORS

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vested in the Alien Property Custodian

Application filed September 4, 1940

This invention relates to variable resistors having a solid resistance body and adapted to carry very high loads, and more particularly to variable resistors for controlling power circuits. The parts of the resistance body of such variable resistors may be heavily loaded as regards the current density and are therefore liable of being deteriorated. When carrying out switching operations in power circuits such resistors must be capable of varying their resistance within a very short time and must therefore withstand also considerable mechanical stresses. Any undue thermal stress of the resistance body or of the contact cooperating therewith reduces at the same time the mechanical strength of the variable resistor and renders it unsuitable for the above purposes.

According to the invention the above-mentioned drawbacks are removed by the fact that the current carrying parts of the resistance body are so alternately stressed during the control that no part is subjected to a high current density. The tubes of current in which the max. current densities occur shall hereinafter be referred to as current core. According to the invention the volume elements of the resistance body carrying the current core must therefore change their position during the control.

The control is effected with the aid of such resistors for controlling power circuits within a fraction of a second. According to the invention the parts of the resistance body carrying the current core are only stressed temporarily by the latter during a portion of the short duration of control. In this way the resistance material is kept in good condition and the life of the variable resistor is considerably increased. Consequently, the volume elements of the resistance body carrying the current are therefore replaced in the shortest possible time by other elements so that the highly heated points wander through the resistance body. Owing to the rapid wandering of these points no undesirable accumulation of heat can occur in any part of the resistance body.

This may be accomplished according to the invention by causing the inlet point as well as the outlet point of the current core to wander along the resistance body. While in the known variable resistors a current junction is stationary on the resistance body and only the other current junction changes its position, both junctions or at least both end points of the current core change their position so that the effective current paths are shifted over their entire length

relatively to the resistance body. This shifting must not be brought about by moving the current junction but may also be caused by moving the resistance body with respect to the stationary current junctions.

In Fig. 1 of the accompanying drawings is shown a rod or plate-shaped resistance body  $w$  on which slide two current contacts  $s_1$  and  $s_2$ . For the control the two contacts are shifted in the direction as indicated by the arrows to the position shown in dash lines so that the middle current path  $c$  of the current core is shifted within the resistance body in its longitudinal direction. The same effect occurs also when shifting the resistance body with respect to both stationary contacts. In this case the change in resistance may be brought about either by the fact that the specific resistance of the resistance body differs in its longitudinal direction so that the two contacts for a constant distance are shifted to points having another specific resistance, or in the case of a homogeneous material the resistance between the contacts may be varied by moving both current contacts with different speeds. If in the end position the contacts are, for instance, spaced from one another more than in their initial position the effective resistance between the contacts is greater. According to the invention the two contacts must in this case also be moved to such an extent that the effective current path lies on another point of the resistance body.

It is particularly advantageous, if the movement of the current contacts, serving to control the resistance and their motion serving to displace the current core take place in different directions. For instance, one or both of the contacts  $s_1$  and  $s_2$  may be displaced during the control in the arrangement shown from one another in the plane of the drawing, while they are shifted at the same time over the surface of the resistance body  $w$  perpendicularly to the plane of the drawing. Also in this case the entire resistance body is traversed by current paths; however, the current paths effective for stressing the resistance body—the portion of the current paths referred to above as current core—are crowded within the space of the shortest possible connection between the two current contacts. This current core is therefore shifted according to the invention during the control to other points of the resistance body.

The two contacts  $s_1, s_2$  may also lie as shown in Fig. 2 at different sides of the resistance body  $w$ , which has the advantage that the surfaces over which they slide are better cooled and that

both current contacts may be moved in the direction of the line connecting the same without the surfaces overlapping each other over which the contacts slide. Also in the arrangement shown in Fig. 2 it is possible to shift the current core in the longitudinal direction of its middle portion as well as perpendicularly thereto with respect to the resistance body.

According to Fig. 3 the transverse displacement of the current core may be effected in the direction of the contact movement effecting the change in resistance, by arranging the two current contacts  $s_1$  and  $s_2$  on opposite sides of a resistance body whose specific resistance varies continuously or step by step. In this case the current path between the contacts run across the resistance body. If the current contacts are displaced to points having another specific resistance, the current core wanders at the same time perpendicularly to its longitudinal direction without substantially varying its own length.

Instead of the one movable current contact (for instance  $s_2$ ) as shown in Fig. 3, also a stationary current junction may be employed which is arranged on the rod or plate-shaped resistance body at the side away from the contact surface and which extends over a considerable portion of this side.

According to Fig. 4 also two rod or plate-shaped resistance bodies  $w_1$  and  $w_2$  of the type shown in Fig. 3 slide over one another whose current junctions are arranged on the outer sides and take up the entire length of these sides. The current junctions  $a_1$  and  $a_2$  consist in this case of metal layers which are integral with the metal contacts  $m_1$  and  $m_2$  respectively lying at the end of the corresponding resistance body whose specific resistance is smallest. In particular cases also non-metallic parts having a sufficiently small specific resistance may be employed instead of these metal parts. In the position shown in Fig. 4 the parts  $m_1$  and  $m_2$  are in engagement with each other. The connection is therefore practically

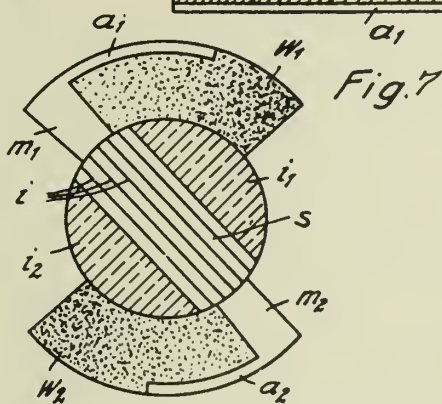
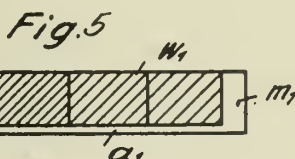
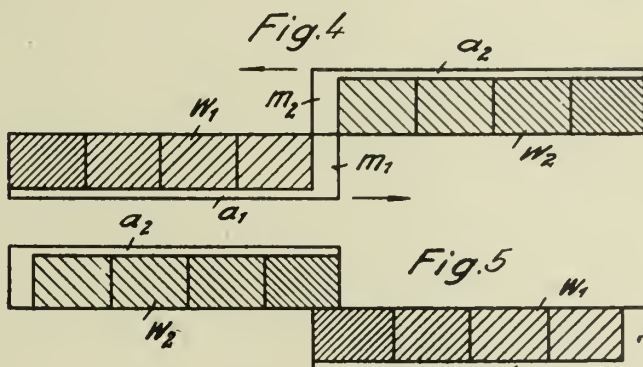
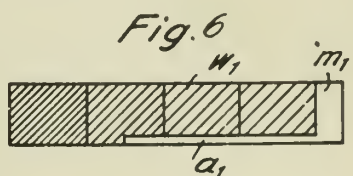
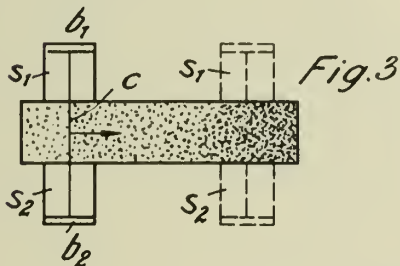
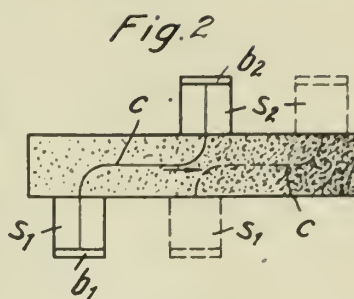
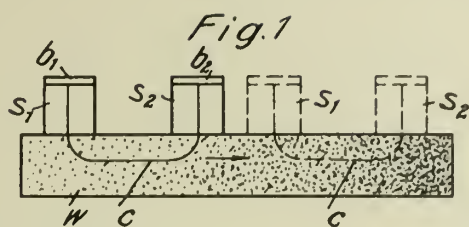
without resistance. If the two bodies are shifted with respect to each other in the direction of the arrows, sections of higher specific resistance are inserted one after the other in the core of the current paths until, in the end position shown in Fig. 5, the sections of the max. specific resistance lie upon one another. During the control the current paths run substantially perpendicularly to the contact surface of the two resistance bodies and new volume elements come continuously into the zone of the max. current density.

In the control positions of the greatest resistance the current load of the resistance body is small and non-detrimental and in this phase of control the stressed volume elements need no longer change their position. Consequently, it suffices if the current junctions  $a_1$  and  $a_2$  extend as shown in Fig. 6 only over a considerable portion of length of the resistance bodies  $w_1$  and  $w_2$ .

The same applies to the forms of the invention shown in Figs. 4 and 5.

The wandering of the current core in the resistance body may be facilitated by subdividing the current contact. The contacts consist of various metal layers separated by insulating layers or layers of greater specific resistance substantially perpendicular to the contact surface of the resistance body. In Fig. 7 is shown, for instance, a laminated contact  $s$  with insulating layers  $i$ . This form of the invention prevents a crowding of the current paths at the edge of the contact, particularly in one or both end positions of the current paths. The resistance bodies  $w_1$  and  $w_2$  are arcuate and come into engagement with the current contact  $s$  at the cylindrical surfaces opposite to each other. Their specific resistance increases from the end provided with the metal contacts  $m_1$  and  $m_2$  respectively towards the other end. The current contact  $s$  is associated with insulating pieces  $i_1$  and  $i_2$  to form a cylindrical body.

FRIEDRICH GIEFFERS.



Inventor  
Friedrich Gieffers  
by Knight & Sons  
Attorneys



# ALIEN PROPERTY CUSTODIAN

## CONNECTION FOR CARBON SEGMENTS OF COLLECTORS

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Germany; vested in the Alien Property Custodian

Application filed September 4, 1940

This invention relates to a connection for carbon segments of collectors.

It is an object of the present invention to provide simple and reliable means for applying to the carbon segments a metal terminal to which the wire ends of the rotor may be soldered.

With this and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which

Fig. 1 is an end view of a carbon segment having the invention applied thereto.

Fig. 2 is a section on line A—B of Fig. 1.

Fig. 3 is a section similar to Fig. 2, but including the connecting wire.

Fig. 4 is an end view of a modification.

Fig. 5 is an end view of a further modification.

Fig. 6 is an end view of another modification.

Fig. 7 is a section on line C—D of Fig. 6.

Similar characters of reference denote similar parts in the different views.

Referring now to the drawings in greater detail, and first to Figs. 1, 2 and 3, it will be noted that the segment 1, consisting of carbon, more particularly of artificial carbon material, and forming part of a collector or commutator for electric machines, is provided with a longitudinal through-going bore 2 by a boring, drilling or pressing operation. For example, the bore may be made in the segment as the same is pressed in a rod extrusion or bar pressing process. Now a length of wire 3 which is substantially thinner than the diameter of the bore, may be introduced into the same, but owing to its loose mechanical contact with the walls of the bore no reliable electrical contact would be established. In order to ensure a safe electrical contact, the wire is passed through the bore to project from the opposite end thereof by an amount corresponding to the length of the carbon segment and the projecting end is then corrugated by means of a suitable device of obvious construction. The corrugated length of wire is then withdrawn to engage resiliently the walls of the bore, as shown in Fig. 3, whereby a safe contact is established, in a similar manner as with the carbon rods for arc lamps formerly in use. The projecting portion

of wire 4 serves for forming the connection to the windings or coils of the rotor of the electric machine and may be left in wire form or stamped to the form of a flat lug.

Where the carbon segments are pressed singly, it may be difficult to apply a bore therein, if its length exceeds a certain amount. In this case, a groove 5, preferably shaped as shown in Fig. 4, may be included in one of the side faces of the segment, for reception of a length of wire 6 which is inserted into this groove before the segments are assembled to a collector, and forced into the same by the intermediate insulating layers 7, Fig. 4. Corrugation of the wire 6 is not required if the same is made to project slightly from the groove. By way of alternative, strips of metal foils or metal texture 12, Fig. 5, may be provided in a larger groove 8, the depth of which should be slightly smaller than the metal insert 12.

According to a further modification, illustrated in Figs. 6 and 7, the carbon segments 1, which are grooved at 10 as shown, may be first assembled to a complete collector, together with the intermediate insulating layers 7 which are formed with a similar groove 11, while the connecting wires 12 are then passed through the groove 10, 11, corrugated as described with reference to Fig. 3, and withdrawn to engage the groove 10.

It will be appreciated that my invention represents an extremely simple and cheap design for the connection between the segments of the collector and the wire ends of the rotor, which meets all requirements.

In special cases, for instance, where tensions and wedge effects shall be avoided, the corrugation of the wire may be dispensed with, provided that care is taken for the wire to be fixedly seated in the bore or recess, e. g., by means of a conductive hardening paste or cement, as indicated at 13 in Fig. 6.

Generally, copper or bronze will be used as a material for the connecting wires or inserts, but it is also possible to use the so-called "Copal" or similar cheaper alloys consisting, e. g., of copper and aluminium.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

OTTMAR CONRADTY.



PUBLISHED  
MAY 18, 1943.  
BY A. P. C.

O. CONRADTY  
CONNECTION FOR CARBON SEGMENTS  
OF COLLECTORS  
Filed Sept. 4, 1940

Serial No.  
355,391

Fig. 1

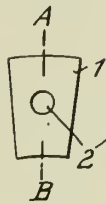


Fig. 2

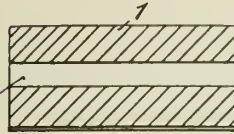


Fig. 3

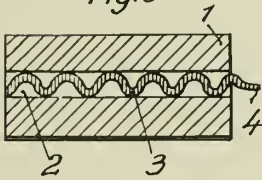


Fig. 4

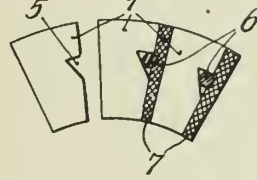


Fig. 6

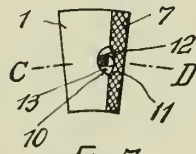


Fig. 5

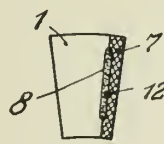
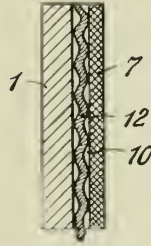


Fig. 7



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# ALIEN PROPERTY CUSTODIAN

## METHOD FOR AERODYNAMICALLY BRAKING AIRCRAFT IN FLIGHT

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No Drawing. Application filed September 4, 1940

This invention is directed to a method for aerodynamically braking aircraft in flight by reversing the pitch of the propeller blades from positive to negative pitch. More particularly the invention is directed to a method of obtaining aerodynamic braking by setting the blades of a constant speed propeller in negative pitch, and then adjusting the constant speed regulator to obtain an increased braking effect.

It is already known to obtain aerodynamic braking of aircraft in flight by setting the propeller blades of a constant speed propeller to negative pitch, and to increase the fuel supply to the engine while the blades are in negative pitch in order to increase the braking force of the propeller. This method of securing aerodynamic braking with a constant speed propeller is not entirely successful, because an increase of fuel supply to the engine when the blades are in negative pitch only serves to increase the angle of negative pitch, as the engine speed does not change because of the constant speed regulator, and an increased pitch by itself does not give a very great increase in braking action. A further disadvantage of this method is that when normal flight is resumed and the blades are returned to positive pitch, a number of successive manipulations of the aircraft controls by the pilot are necessary. For example, in turning the blades from a negative to a positive pitch, the fuel supply to the engine must be throttled down to engine idling speed and then increased after the blades have turned through zero pitch into positive pitch. If this is not done, the engine would harmfully race when the blades are rotated through zero pitch.

It is an object of this invention to operate a constant speed variable pitch propeller mechanism so that an increased braking effect is obtained when the engine is supplied with fuel sufficient only for idling speed and the blades are in negative pitch.

Another object of the invention is to obtain an increased aerodynamic braking effect in a constant speed propeller when the blades are at negative pitch without the necessity of increasing the fuel supply to the engine.

In general this method is accomplished with the use of ordinary constant speed variable pitch propeller mechanisms in which the propellers can be turned to negative pitch, by adjusting the constant speed regulator of the mechanism when the blades are in negative pitch. As the forces of the relative wind upon a propeller vary as the square of the speed of the propeller, it is clear

that if the constant speed regulator is set to give a reduced negative pitch angle for any throttle setting, the engine and propeller speed will be increased, and a greater aerodynamic braking effect will be obtained. The method is applicable to all types of constant speed propellers.

More specifically a constant speed variable pitch propeller mechanism usually consists of a variable pitch propeller, a speed responsive governor for changing the pitch of the propeller upon changes of the load upon the propeller so as to maintain a constant propeller speed, and an engine throttle for varying the fuel supply to the engine. The engine throttle may be connected to a mechanism for reversing the pitch of the propeller blades so that as the blades are rotated through zero pitch, the fuel supply to the engine is almost cut off, and consequently the engine will not race. When the blades are in negative pitch, the constant speed regulator according to previous methods remains unchanged so that an increase of the fuel supply will cause a corresponding increase in the negative angle of pitch of the blades and accordingly the engine speed is unchanged. By the method of the instant invention, the fuel supply to the engine is left unchanged when the blades are put in negative pitch, and an increased aerodynamic braking effect is obtained by varying the constant speed regulator to give a reduced negative pitch angle to the blades so that an increased engine speed is obtained. In other words, without increasing the fuel supply to the engine, the propeller blades assume a lower negative pitch than they would have in positive pitch, for a similar engine fuel supply, and consequently an increased propeller speed is obtained which gives a greater aerodynamic braking effect as the braking effect of the propeller depends upon the forces produced by the relative wind on the propeller, said forces varying as the square of the speed of the propeller.

This method is applicable to all types of propellers, and reference is made to the United States application for Letters Patent of Otto Mader for "Means for Braking Aircraft" S. N. 109,464, filed November 6, 1936. The method is applicable to any variable pitch propeller which is constructed to be operated at a constant speed through the entire adjustable range of the propeller blades in positive pitch, if beyond the nominal propeller pitch range there is still available an adjustable range wherein the propeller can be operated at higher speeds without endangering the engine.

In general, however, the constant speed propellers are not proportionally reduced in pitch when the engine is throttled to engine idling, this being to prevent the engine from racing when the propeller blades are rotated through zero 5 pitch, when being changed from positive to negative pitch. In other words, the constant speed mechanism is arranged to keep the blades at a slightly increased pitch over the normal pitch for that throttle setting. In adjustable propellers 10 of this type, when the throttle is set for engine idling, and after the propellers have assumed their pitch angle for such throttle setting, the reversing mechanism is actuated in the usual manner so that the propeller blades take a negative 15 pitch while the engine speed is unchanged, and thus the propeller exerts a braking action on the aircraft. According to the method of the

instant invention, if it is desired to increase this braking effect, the propeller speed is increased by adjusting the constant speed regulator to decrease the negative pitch, and consequently increase both the engine and the propeller speed.

Resumption of normal flight after the braking of the aircraft has been accomplished, requires no preliminary adjustment of the apparatus with respect to the throttle setting so the danger of any inattention which may affect the safety of the engine is eliminated. To resume normal flight with a positive setting of the propeller blades, it is only necessary to reverse the propeller blade adjusting mechanism, and if necessary, readjust the constant speed regulator to 15 give a new constant speed for the engine.

GERHARD CORDES.

ALIEN PROPERTY CUSTODIAN

PROCESS FOR ELECTROLYTICALLY PRODUCING BRIGHT DEPOSITS OF ZINC ON OTHER METALS, FOR EXAMPLE ON IRON

Wolfgang Howaldt, Andernach on Rhine, and Rudolf Halfen, Weissenthurm on Rhine, Germany; vested in the Alien Property Custodian

No Drawing. Application filed September 5, 1940

The known process for electrolytically producing bright deposits of zinc on other metals, for example on iron, are based upon the use of alkaline baths, for example. These are connected with the disadvantage that poisonous materials, especially cyanides, are used for this purpose, which makes the application of such baths extremely dangerous for the attendant. It is also known to use acid baths which, however, hitherto were connected with difficulties inasmuch as it was practically not achieved to produce with these acid baths a high gloss zinc plating. Thus, for example, a sugar solution, syrup, and onion-juice were proposed as additions to acid baths for producing gloss.

It has now been found that a mirror-like brilliancy of the zinc deposits may be obtained by adding to acid baths sulphurous acid or its salts. The addition of aliphatic or aromatic aldehydes is also of advantage. Particularly fine deposits are obtained if additive compounds of sulphurous acid or its salts with aldehydes are added to the baths. The compounds are added singly, or several are added at the same time. It is remarkable that the addition of very small quantities (about 1 to 2 %) is sufficient to produce a high gloss zinc plating.

Examples

(1) Zinc sulphate	Grams 250
Aluminium sulphate	20
Boric acid	20
Cadmium sulphate	1
Sodium sulphite	2

to 1 litre of the bath.

(2) Zinc sulphate	Grams 300
Ammonium alum	15
Ammonium chloride	15
Cadmium sulphate	0.5
Benzaldehyde	1
Potassium metabisulphite	1.5

to 1 litre of the bath.

(3) Zinc sulphate	Grams 300
Potash alum	15
Boric acid	20
Cadmium sulphate	1
Salicylaldehyde potassium bisulphite	2

to 1 litre of the bath.

(4) Zinc sulphate	Grams 250
Aluminium sulphate	15
Aluminium chloride	15
Cadmium sulphate	1
Benzaldehyde	0.5
Sulphurous acid 5%	0.5

to 1 litre of the bath.

These baths will serve to deposit high gloss zinc platings of any desired thickness with current densities of, for example 400 amps. per square metre. The acidity of the bath should preferably not exceed  $ph=4$ . In the examples given above, the acid reaction is substantially caused by hydrolysis of the component parts. As the acid contents of the bath gradually decreases during the electrolysis owing to the chemical decomposition of the anodes, the bath requires acidifying from time to time or continuously. This is suitably done with aqueous sulphurous acid which regulates the acidity.

The advantages of the process according to the invention consisting in the high current density and the 100% electrolytic efficiency of the bath is completely utilized. Therefore, subsequent dipping of the high gloss zinc plating in diluted nitric acid or in an acidic solution of hydrogen peroxide, etc., is not required.

WOLFGANG HOWALDT.  
RUDOLF HALFEN.



ALIEN PROPERTY CUSTODIAN

ARRANGEMENTS FOR MEASURING  
FREQUENCY CHARACTERISTICS

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Alien Property Custodian

Application filed September 6, 1940

This invention relates to devices for testing the frequency characteristic of electrical devices and consists in certain features of novelty which are described hereafter in connection with the drawings, in which

Fig. 1 is a graph referred to in explaining prior arrangements, Fig. 2 is a graph that serves to explain the function of another kind of prior devices and also serves to disclose the idea of the present invention, Fig. 3 is a diagram representing one embodiment of the invention, Fig. 4 is a fragmentary diagram showing a modification of the arrangement illustrated in Fig. 3.

In the serial manufacture of electric constructional parts or assemblies the frequency characteristic thereof is in many cases tested or adjusted by means of devices by which the frequency characteristic is directly recorded on the screen of a cathode ray tube. The frequency of an alternating voltage generated in the testing device is periodically changed within the range to be tested. In the same rhythm the beam of the cathode ray tube is deflected in the direction of the time line, thus allotting a definite frequency to each point of the time line. When now this beam is deflected perpendicularly to the time line and in accordance with the penetrability peculiar to the member under test, then a curve is traced on the screen of the cathode ray tube, such curve representing the frequency characteristic.

In such testing devices the time line of the cathode ray tube has in general points marked with indications of the appertaining frequencies.

It is desirable that jumps in frequency which belong to paths of the same length be equal to each other because in such case the curves obtained are of the conventional representation. A frequency scale, however, that involves such proportionality is not easy to produce, as is explained in the following.

For instance, where the capacity employed for controlling the testing frequency, and the deflection in the direction of the time line as well, are varied in sinusoidal fashion, as is customary in simple devices of this kind, a distorted frequency scale results. Since the frequency does not vary proportionally with the capacity, as can be seen from the formula

$$f = \frac{1}{2\pi\sqrt{LC}}$$

the scale is crowded at its end and the curve hence is not a proper illustration of the frequen-

cy progress. Therefore, when considering the curve also the distorted frequency scale must always be taken into consideration. In Fig. 1, *a* is the resonance curve on the linear scale while *b* is the resonance curve on a distorted scale.

In other devices the frequency variation is produced by inductance variation. For instance, the frequency of an oscillator in which the coil of the oscillatory circuit has a core of high frequency iron, may be much varied by polarizing the high frequency iron. To such end the high frequency iron is preferably arranged in the iron core of a low frequency choke which is then more or less efficiently energized by an alternating current or a pulsating uni-directional current. The frequency of the high frequency generator then varies as the fluctuations of such energization.

Fig. 2 illustrates the interdependence between the energizing current and testing frequency of an arrangement of the latter type. As will be seen, the curve here shown is within a large region substantially rectilinear, that is to say, the frequency variation is proportional to the current variation. Despite this, however, no linear frequency scale can be traced on the screen of the cathode ray tube because on the one hand it is at all very difficult, on account of the time constant

$$\frac{L}{R}$$

of the coils, to obtain a rectilinear rise of current, while on the other hand the deflecting voltage and the current variation in the choke must be produced by electron tubes, the curvature of the characteristic curves of these tubes rendering it almost impossible to avoid distortions. Differences in phase arise to a considerable extent.

In order to do away with all these sources of error and thereby to obtain a linear frequency scale it is proposed by the invention that the variation of the testing frequency and the deflection of the beam be effected by the same current. The deflection in the direction of the time line is here effected magnetically, that is, in a manner not usual with testing arrangements.

In this way, since both the deflection *A* on the screen of the cathode ray tube and the frequency variation *f* of the high frequency generator (straight portion of the curve of Fig. 2) are proportional to the current, proportionality between deflection and frequency is obtained with cer-

tainty, as will appear from the following equations:

$$A = C_1 \cdot i$$

$$\frac{\Delta f = C_2 \cdot i}{\Delta f = \frac{C_2}{C_1} \cdot A}$$

where  $C_1$ ,  $C_2$  are constants.

In Fig. 3, which shows an arrangement for effecting the invention  $L_S$  denotes the inductance of the oscillatory circuit forming part of an oscillator O, this inductance having to be varied. The current for feeding both a deflecting coil  $L_A$  and a magnetizing coil  $L_M$  is controlled by an electron tube  $R_1$ . In this connection the current variation need not be in the nature of a special curve, such as a sine curve or a saw-tooth curve, the frequency variation  $\Delta f$  being in any case proportional to the deflection  $A$ , as will appear from the equation herebefore deduced. The aim, of course, should be to have a fairly constant rise of current in order to insure that the recording speed in the cathode ray tube and hence the brightness of the record be likewise constant. In a given case the brightness of the cathode ray tube might be controlled in dependence on the recording speed.

Reverting to Fig. 2 it will be seen that a proper utilization of the frequency variation characteristic requires a predetermined average value of current to be employed. To this average value

the steady current adjusted by means of tube  $R_1$  corresponds. Such steady current, however, also acts to deflect the beam of the cathode ray tube from the middle of the screen S thereof. The deflecting coil  $L_K$ , intended to compensate the steady field deflection, is for this purpose so dimensioned and connected that the steady current flowing through it shall reconduct the recorded curve to the middle of the fluorescent screen. A potentiometer P serves to regulate the mid-position within narrow limits. By varying the steady current of tube  $R_1$  the entire frequency range may now be altered without the curve changing its position.

The frequency range of the testing device is determined by the ampère turns of  $L_M$ . In order to provide for altering this range the coil  $L_M$  is fitted with taps, as  $a$ ,  $b$ ,  $c$ ,  $d$ . When employing the small ranges  $b-d$  or  $c-d$  it will be of advantage to replace the remainder of  $L_M$  by a substitute inductance connected to the taps  $a$ ,  $b$  or  $a$ ,  $c$ , respectively.

Where a pure alternating current is used for deflecting and polarizing, as in the case of Fig. 4, the ampère turns necessary for adjusting the proper working point must be provided by means of a coil  $L_v$ . This coil likewise enables the frequency range of the testing device to be changed.

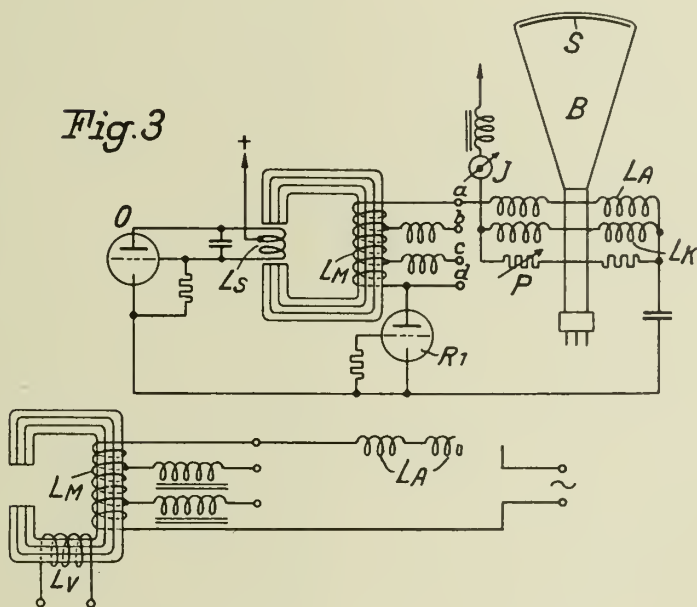
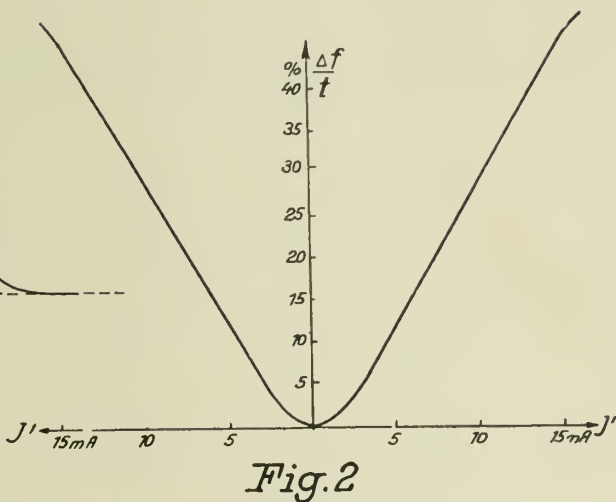
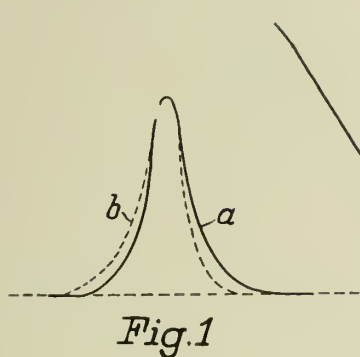
J, Fig. 3, denotes a measuring instrument, while  $J'$ , Fig. 2, indicates the current flowing through this instrument.

PETER DESERNO.

PUBLISHED  
MAY 18, 1943.  
BY A. P. C.

P. DESERNO  
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Filed Sept. 6, 1940

Serial No.  
355,599



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Att'y

INVENTOR

BY

ATTORNEY



# ALIEN PROPERTY CUSTODIAN

## METHOD FOR DECREASING OR PREVENTING THE ACTIONS OF PICKLING ACID ON METALS, ESPECIALLY IRON- AND METAL-ALLOYS

Willibald Machu and Oskar Ungersböck, Vienna, Germany; vested in the Alien Property Custodian

No Drawing. Application filed September 9, 1940

When metallic, especially iron articles and articles consisting of metal alloys are exposed to the action of the air and particularly at higher temperatures, oxygen compounds are formed, such as layers of oxide or hydroxide and hammer-scale, which layers must be removed prior to any further treatment such as for instance application of coatings, cold-drawing, fine-rolling and the like.

For removing these oxygen compounds dry-cleaning or wet-cleaning methods are generally used. The first of these methods is of a mechanical kind and effected by means of sand blast apparatus, grinding or the like. The second mentioned cleaning method is either of chemical kind and effected by treatment with diluted (aqueous) solutions of mineral acids, preferably hydrochloric acids or sulphuric acids, this proceeding being generally called "pickling", or by electrolytic method.

The dry-cleaning, as compared with the wet-cleaning, is employed only very seldom as it is difficult to carry out, expensive and cannot be used everywhere.

The cleaning of the material by means of acids ensures a complete removal of all oxides but has a number of serious inconveniences.

As the layer of oxide or hammer-scale does not cover the surface of the material in uniform thickness, the core metal under the layer is strongly corroded in the course of the pickling proceeding after the thinner layers of oxidic character have been removed. This dissolution of metal is accompanied by strong development of hydrogen, whereby not only the pickling acid is squirted about in the room where the treatment takes place so that the health of people staying in the room is endangered, but the hydrogen is absorbed in atomic state by the core metal in the form of an alloy of the metal with the hydrogen gas. This proceeding, for instance on articles of iron, leads to a considerable quality decrease in the form of the feared pickling brittleness. With this pickling brittleness is connected, besides an unnecessarily strong metal dissolving which has to be considered as loss, an undesirable roughening of the metal surface and a just as undesirable loss in pickling acid.

For avoiding the inconvenience of the excessive development of hydrogen a so-called slackening medium or economical mordant is added to the pickling acids. This medium consists of organic and sometimes of inorganic substances. In the patent literature numerous propositions of this kind are described which concern very different

media used all with the same object in view, that is to exert a slackening effect on the hydrogen development when the pickling acid acts upon the metal, and to practically exclude the dissolution of the core metal.

In spite of these possibilities just the well protecting economical mordants possess the inconvenience that their application, if made to sufficient extent, considerably increases the cost of the cleaning proceeding. For this reason one often renounces in practice on the application of economical mordants and puts up with the inconvenience of the hydrogen development and the loss of metal and acid. A quantity of economical mordant from 0.05 to 0.1% of the weight of the acid mordant is usually required to obtain a sufficient slackening effect on the action of the core metal of iron articles and with employment of a 10% sulphuric acid of 60° C.

When the electrolytic cleaning method is employed, the metal articles in question are treated either as cathodes or as anodes or according to the middle conductor principle with direct- and alternating current.

Either acids or lyes or also solutions of neutral salts serve as electrolyte. In alkalis as well as in the solutions of neutral salts a sufficient removing of certain metal oxides, for instance of the pertinaciously adhering hammer-scale layers is obtained only with difficulty. If the material to be treated is interposed as cathode into the electrolyte consisting of acid the layer of hammer-scale can be removed and partly a metal dissolution can be reduced, but it is not possible to attain a stronger reduction of the loss in metal on account of the high corroding temperatures and acid concentrations. Owing to the cathodically developed hydrogen very much pickling acid is lost by spraying at the usual high current densities from 100 to 1000 amperes per square meter cathode surface, and the danger that the pickling brittleness occurs is also considerably increased.

If the material to be treated is anodically inserted in the electrolytic proceeding, the losses in metal dissolved anodically by the current are added to the loss in metal due to the action of the acid and these losses can then no longer be supported economically.

At the application of the central conductor system in the acid electrolyte the influence of the cathode, as has been ascertained by the applicant, is stronger than that of the anode; this method is therefore technically useful. It demands, however, for the technically useful pickling period rather high current densities from 100

to 500 amperes per square meter electrode surface.

The above explained inconveniences of the wet-treatment method can however be avoided according to the invention, if a combinatoric combination of the acid treatment of the metallic, preferably iron material is carried out with addition of substances having an economical mordant character with simultaneous effect of the electric current.

The expression "substances having a character of economical mordant" means all those substances or mixtures of substances preferably of organic kind, which are capable of reducing the action of the acids on metals or to practically completely eliminate the same and which are known on the market under the designation "slackening medium", "economical mordants" or "inhibitors". To these belong further other known additions of organic kind, such as dextrin, glues, gum arabic, gelatine, turkey red oils and so on. They must, in any case, have the effect to slacken the corrosion of metals when added in sufficient quantities to the pickling acids.

No explanation is necessary in the present instance by which proceedings in detail the presence of organic slackening media of the kind stated or which have become known from the patent literature exerts a slackening or preventing effect upon corrosion of the metallic material by the acid mordant in question, if according to the invention the material to be treated is further interposed in an electrolytic circuit. It ought to be sufficient, that applicants have ascertained that the stated effect, prevention of an excessive hydrogen development and also of the pickling brittleness of the iron and therefore of the losses in metals and acids occur, besides a considerable reduction of the usual high current densities at the electrolytic cleaning processes, if according to the invention organic substances possessing the character of economical mordant are added to the electrolyte. In any case, instead of the current densities from 100 to 1000 amp/m<sup>2</sup> surface usual up to the present, current densities below 50 amp/m<sup>2</sup> down to 1-10 amp/m<sup>2</sup> may be employed, whereby it is possible to use considerably smaller electric unities for the current supply. Further it could be ascertained, that by the simultaneous cathodic polarization in presence of organic substances having the character of economical mordant considerably less great quantities of these mordants are required than up to the present without admission of current at the treatment of the material with acid mordants.

Instead of concentrations between 0.05 to 0.1% of the slackening medium to the acid, concentrations from 0.0025 to 0.005% will be sufficient, i. e. quantities which are only  $\frac{1}{40}$  or less of those which were required up to the present for obtaining a protecting effect of 90 to 95% in a 10% sulphuric acid heated to 60° C. Hereby the employment of economical mordants has been enabled economically in general. The experiments carried out have proved that with good slackening effect a low concentration of the addition with character of an economical mordant required the application of a higher current density and inversely a higher concentration makes it possible to employ a lower current density.

It has been ascertained that metal articles, which have been treated in acids with simultaneous action of the electric current and in presence of organic substances having the character of economical mordant, do not only show no pick-

ling brittleness, but assume also a better and more brilliant appearance than, for instance, goods which have been treated merely electrically or mechanically. Similar advantages as result already from the treatment of the metal articles as cathodes can be obtained at the electrolytic pickling according to the middle conductor process, as in this instance, as already explained, the influence of the cathode is preponderant to that of the anode.

The connection of the metal articles to the current can be effected in any manner known in the technics of the electrolytic treatment of metals or in the galvanotechnics, for instance by clips, jaws or wires, bands and so on in the continuous method, by rollers, rolls or the like. For wire- and band-rings it has proved to be preferable to thread these as carriers from current conducting material such as iron, monel metal and others and to connect such carriers with the source of current. The current may however be fed alone according to the well known central conductor principle by the electrolyte.

Any desired kind of current may be employed and the polarity of the current may be reversed from time to time, intervals without current may be interposed, direct current may be overlaid with alternating current and so on.

The method according to the invention may be preferably employed also for cleaning stationary containers, steam boilers, pipe conduits and so on of heavy metals or light metals from stone-like deposits or other impurities by means of acids. Also the alloyed steels, especially rust-free steels which are difficult to clean and pickle can be treated with acid according to the present method.

#### Example

The action of a 10% sulphuric acid at 60° C upon a plate of soft iron sheet metal amounted to 250 g/m<sup>2</sup> calculated for a day at two hours duration of experiment. This loss was reduced to only 14 g/m<sup>2</sup> per day by addition of 0.05% of a slackening medium known in commerce and at similar experimental conditions. The slackening effect which has been ascertained amounts to about 94%. A 10% sulphuric acid containing 0.0025% of the same slackening medium resulted in an iron loss of 163 g/m<sup>2</sup> per day, which means a slackening effect of only 35%. If the plate of soft iron sheet metal was treated cathodically in pure 10% sulphuric acid at 60° C, a slackening effect of only about 79-80% could be obtained even at high current densities, for instance 10 amp/m<sup>2</sup> and above. If the same sheet metal plate was treated at 60° C in sulphuric acid of 10%, which contained 0.0025% of the slackening medium, at a current density of only 0.7 amp/m<sup>2</sup> the metal loss amounted to only 3 g/m<sup>2</sup> per day, which means a slackening effect of 98.8%. In spite of the fact that  $\frac{1}{20}$  of the quantity of the slackening medium and about  $\frac{1}{4}$  of the former current density were used, the slackening effect obtained was considerably greater.

On the anode, on which the capability of the iron to dissolve is always increased, the action of the iron in sulphuric acid of 10% at 60° C at a current density of 1.25 amp/m<sup>2</sup> is increased from 250 g/m<sup>2</sup> per day to 620 g/m<sup>2</sup> per day, that is to 248% of the initial value. If to the sulphuric acid 0.0025% of the slackening medium is added the action amounts under similar conditions and at similar anodic current density to only 393 g/m<sup>2</sup> per day, that is it has been increased to only about 157%.

If the middle conductor pickling method is employed, the solubility is reduced from 250 g/m<sup>2</sup> per day to 187 g/m<sup>2</sup> per day at a current density of 0.3 amp./m<sup>2</sup>, because, as has been ascertained, the cathodic protection is surprisingly preponderant to the anodic solubility. The slackening effect amounts in the present instance to 25%.

In the currentless state a reduction of solubility from 250 g/m<sup>2</sup> per day to 163 g/m<sup>2</sup> per day at a slackening effect of 35% results as already 10

mentioned with an addition of 0.0025% of the slackening medium to a sulphuric acid of 10% heated to 60° C. If however both methods are applied at the same time, i. e. 0.0025% of the slackening medium and 0.3 amp./m<sup>2</sup>, only 90 g/m<sup>2</sup> per day are dissolved in two hours, which corresponds to a slackening effect of 64%.

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# ALIEN PROPERTY CUSTODIAN

## CONNECTION FOR TELEPRINTERS

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Application filed September 20, 1940

This invention relates to a connection for teleprinters, in which a transmitter is combined with various, preferably with two receivers.

Such apparatus presents difficulties as to the remote control, since if the apparatus called over a long distance line had already been called from another long distance line and is in operation, the motor is set in motion and faulty signals are printed in accordance with the actuation of the receiving magnet upon the arrival of the call signal for the second receiver.

This drawback may be removed according to the invention by the fact that the shafts of the receivers are blocked by a pawl whose release is effected in accordance with the reception of the call signal.

The pawl is preferably actuated by means of a magnet which operates in response to the reception of the call signal. If call signals which have a given minimum duration are utilized a known combination consisting of a condenser and a resistor is preferably employed. The locking magnets may be provided with a holding winding so that they remain energized during operation.

Further details of the invention will be apparent from the following description taken in connection with the accompanying drawings, in which

Figs. 1 to 3 show some embodiments according to the invention in diagrammatic form.

Fig. 1 shows the arrangement of the pawl and magnets.

In the state of rest the magnets  $Sp1$  and  $Sp2$  of the control lamps  $K1$  and  $K2$  are deenergized and prevent both receiver shafts from rotating even when the receiver magnet receives the starting impulse. Only upon the energization of the magnets  $Sp1$  and  $Sp2$ , the receiver shaft is permitted to rotate in order to translate the signals received.

In Fig. 2 is shown the switching system for the operation of the apparatus. If, for instance, a call is received over the line  $L1$ , the calling relay  $AR1$  is released in accordance with the calling impulse which consists in an interruption of current. The contact  $ar1$  is actuated to the position shown so that the condenser  $C1$  discharges through the resistance  $R1$ . As soon as the starting impulse ceases, the current flows through the line  $L1$  so that the armature of the relay  $AR1$  is again attracted. The condenser  $C1$  is charged through the winding  $I$  of the magnet  $Sp1$ , which circuit is from: earth, condenser  $C1$ , contact  $ar1$ , magnet  $Sp1$ , battery, earth. The locking mag-

net attracts its armature so that the shaft  $EW1$  (Fig. 1) may begin to rotate and the contact  $sp1a$  is closed. In this manner a holding circuit is established through the winding  $II$  of the magnet  $Sp1$ , extending from earth, contact  $sp1a$ , magnet  $Sp1II$ , quenching key  $LT1$ , battery to earth. The control lamp  $K1$ , which indicates that the receiver with the magnet  $EM1$  (Fig. 2) and the shaft  $EW1$  (Fig. 1) is in operation in the direction of the line  $L1$ , is inserted in the circuit in parallel relation to the circuit just traced. Upon the operation of the magnet  $Sp1$  the motor  $M$  is connected to the current supply circuit  $N$  through the contact  $sp1b$ . The receiving magnet  $EM1$  can receive the signals coming from the direction  $L1$ . The transmitting contact  $sk$  is arranged in this circuit in accordance with the position of the double-throw switch  $U1$ . Over the line  $L1$  an up and down working may therefore be effected with the aid of the receiving magnet  $EM1$  and the contact  $sk$ . Over the line  $L2$  only a reception may be effected at the same time through the change-over switch  $U2$ .

A call arriving over the line  $L2$  acts in a corresponding manner through the relays  $AR2$  and the locking magnet  $Sp2$ . If an up and down working is to be effected the directional switches  $U1$  and  $U2$  which may under circumstances be combined to one switch must be switched over in a corresponding manner. A call over the lines  $L1$  and  $L2$  extending to the remote station takes place after changing over the directional switch in the corresponding position by depressing the key  $RT$ . The closed circuit current is thus interrupted in the line, the remote apparatus is started in the manner described above and also the relay  $AR1$  or  $AR2$  is released at the home station so that the apparatus is allowed to run down.

If the resistance  $R1$  is not of the same magnitude in the calling and called apparatus it may occur that the home apparatus starts, but the remote apparatus does not start at the remote station, because the calling impulse was too short. For this reason auxiliary resistors  $R2$  are in addition provided which are short-circuited through the contacts  $RT1$  and  $RT2$  of the calling key. If the calling key is therefore depressed the time constant of the circuit  $C1$ ,  $R1$  is increased by the resistances  $R2$  so that the calling impulse must be transmitted somewhat longer in order to start the home apparatus, thus ensuring a starting of the remote apparatus.

In Fig. 3 the connection as shown in Fig. 2 is simplified. In this case only one calling relay

AR is provided which, however, carries two windings. Besides only one combination consisting of a condenser and a resistor is provided. The relay AR is so dimensioned that it is already released in the state of rest when current flows over the lines L1 and L2 in the opposite direction in both windings. However, during the operation the armature thereof is attracted owing to the relatively short telegraphic impulse. The operation is effected in the same manner as in Fig. 2. The relay AR is actuated in response to a call, for instance, through the winding II in the event of the line L1 being deenergized. In this manner the condenser C1 is discharged through the resistance W in order to transmit at the end of

the starting impulse upon the release of the relay AR an impulse through the magnet FM1, winding I and the directional switch U1a. The locking magnet FM1 is attracted and remains energized through its contact  $fm_{1a}$ . The motor M is started through the contact  $fm_{1b}$ . Otherwise the operation is effected in the same manner as in Fig. 2.

The connection may be simplified to a further extent if a make and break contact is allotted to the receiving magnet EM1 or EM2 shown in Fig. 2 or 3. This magnet has then the same function as the contacts  $ar_1$  and  $ar_2$  (Fig. 2) or  $ar$  (Fig. 3).

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BY A. P. C.

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CONNECTION FOR TELEPRINTERS

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2 Sheets-Sheet 1

Fig. 1

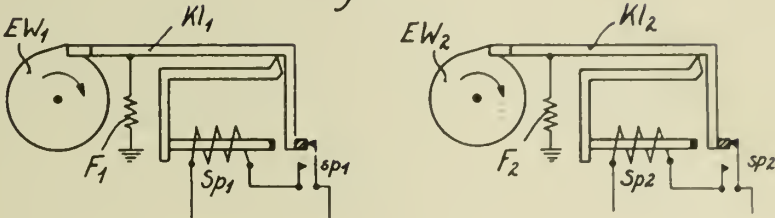
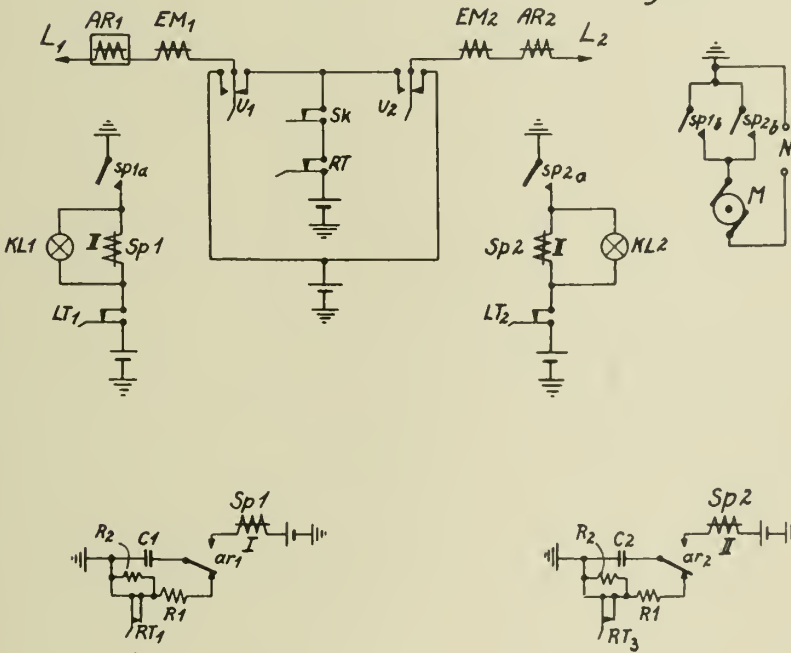


Fig. 2



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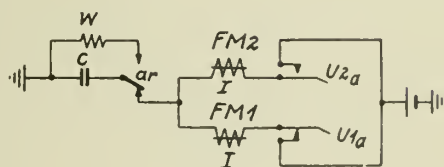
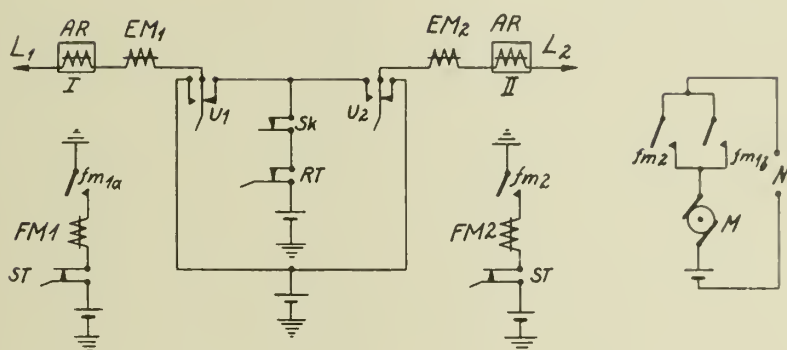
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Fig. 3



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# ALIEN PROPERTY CUSTODIAN

## METHOD OF CONTROLLING THE MOISTURE CONTENT OF GASES TO BE ANALYZED

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in the Alien Property Custodian

Application filed September 25, 1940

This invention relates to a method of controlling the moisture content of gases to be analyzed.

As is well known faults result when analyzing gases if the gas to be analyzed and the standard gas do not have the same moisture. Both gases have therefore been brought to the same dew point either by cooling, which, however, generally presupposes the presence of cooling water which is not always available, for instance, in the tropical region and the employment of which is undesirable in many cases, since it entails upkeep and running expenses or it has also been proposed to convey both gases through drying apparatus in order to remove the moisture therefrom. However, also such apparatus require a continuous control and attendance, since the drying agents become inefficient with time and therefore must be replaced or regenerated. This further entails an interruption of the analysis.

The method according to the invention removes the above drawbacks completely. According to this method the drying agent for the wet gas is at the same time continuously regenerated without it being necessary to interrupt the analysis or without replacing the drying agent. Consequently, the apparatus operates without any attention at all. This may be accomplished by the fact that to control the moisture of the standard gas to be employed for the gas analysis the gas is preferably treated with liquid solvents for water, the solvent being maintained in a state of equilibrium with the water by continuously supplying or drawing off water. Particularly when employing a gas to be analyzed and a standard gas the equilibrium of moisture between these two gases is attained by bringing the gases into the state of equilibrium before analyzing the same so as to bring about a thermodynamic exchange of their moisture. This is accomplished according to the invention preferably by the use of a liquid seal which effects the exchange by dissolving the water of the wetter gas and by re-evaporating this water into the drier gas as well as the drying of the gas containing a greater moisture than the other gas. In this case care should be taken to employ a liquid seal which does not appreciably dissolve the gas to be analyzed and/or the standard gas, since otherwise such a gas when dissolved in the liquid and diffused would reach the chamber intended for the other gas. If the analysis is carried out with gases having a relatively small moisture content glycerine is, for instance, suitable as a liquid seal which owing to its great viscosity dissolves the gases under consideration only to a negligible ex-

tent. If, however, flue gas which has a high moisture content is to be analyzed glycerine is less suitable, since it would soon become so diluted owing to its great water solubility that the liquid seal would practically consist only of water which constitutes a good solvent for gases. In order to avoid this inconvenience, for instance, an admixture of phenol, cresol or aniline may be employed which on the one hand may be mixed with the glycerine in any proportion and which on the other hand dissolve water only to a slight extent so as to ensure a viscosity of about 5 to 15 centipois which the liquid seal must have at an operating temperature in order to effect an analysis free of faults. Of course, it is also possible to use phenol alone instead of adding phenol to glycerine. Instead of phenol also other suitable liquids may be utilized which have a certain solubility necessary for the water exchange and which are sufficiently viscous and therefore dissolve and exchange the gases to a slight extent. The drier the gas to be analyzed should become the more standard gas must be supplied to the exchanger or the drier the standard gas supplied must be.

An embodiment for an arrangement by means of which the method according to the invention may be carried into practice is shown in the accompanying drawing. The supply device with filter 1, condensing vessel 2 and the device 3 and 4 for transmitting the value to be measured as well as the suction fan 5 are devices known in the art and connected in series in the usual manner.

In this case a flue gas taken from the chimney is to be analyzed for the  $\text{CO}_2$ -content (transmitter 3) and  $\text{CO} + \text{H}_2$ -content (transmitter 4). 6 is a container connected in series with the transmitter and in which takes place the moisture exchange according to the method of the invention. The container 6 has, for instance, a circular cross-section and supports inside a cylindrical body 8 cooperating with the liquid seal 7. The conduit 9 extends from the supply device into the cylindrical container 6 for some distance below the level of the liquid 7 so that the gas to be analyzed drawn in by the suction fan must first bubble through the liquid seal 7 before passing to the transmitter through the conduit 10. In the annular space formed by the outer wall of the container 6 and the cylinder 8 is arranged a conduit 11 extending also for some distance below the level of the liquid seal 7 and through which the standard gas, for instance, atmospheric air is supplied to the liquid in the same manner as

the gas to be analyzed, i. e., also the standard gas first bubbles through the liquid seal through which it passes into the standard gas conduit 12 extending to the transmitter. As will be apparent, a mixture of the gas to be analyzed and the standard gas is not possible in this case, since the one gas is limited to the inner space of the cylinder 8 and the other gas to the above-mentioned annular space. The use of finely distributed gases in the liquid or in apparatus which retain the gases for a longer period is not necessary when carrying out the analysis in the usual manner.

It is to be understood that the invention is not limited to the above-described embodiment. Thus it is also possible to provide two cylinders cooperating with the liquid or to modify the apparatus in such a manner that instead of causing the gases to bubble through the liquid seal the latter is raised by a pump to flow over cooling towers. However, an apparatus operating on the principle of the above-described apparatus appears to be more advantageous in that it is not only simpler than the other but also a proper

flowing of the gases may be controlled in an easier and more economic manner owing to the bubbling of the gas through the liquid seal.

For this reason it is therefore preferable to make the container 6 of transparent material. The method is not limited to the use of the gas to be analyzed and of the standard gas. For instance, the same gas can flow before and after the reaction through the two separated parts of the equalizing vessel and of the apparatus for analyzing flue gases in order to carry out a differential measurement. When carrying out volumetric measurements, for instance, of the chemical absorption of a gas it is possible according to the method of the invention to bring the liquid seal for the burette to a constant vapor pressure which corresponds, for instance, to the vapor pressure of the agent employed for the absorption in the manner that an exchange of the water content of the two liquids coming into contact with the gas to be analyzed is effected by means of a particular gas current.

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PUBLISHED

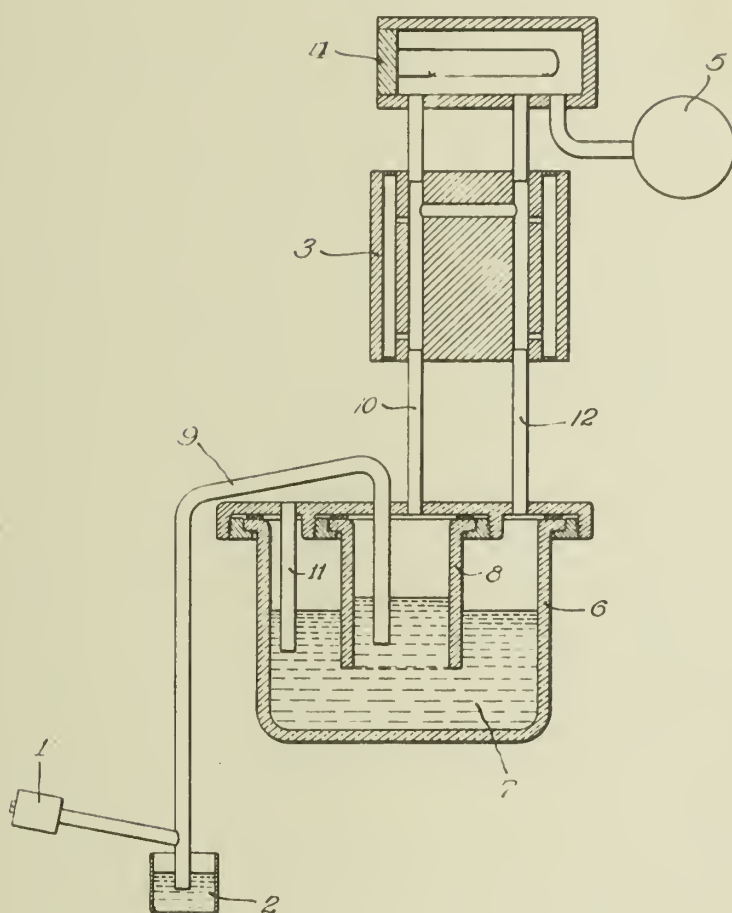
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METHOD OF CONTROLLING THE MOISTURE  
CONTENT OF GASES TO BE ANALYZED  
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# ALIEN PROPERTY CUSTODIAN

## OBLATE FRUIT PEELING MACHINE

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Application filed September 30, 1940

My invention relates to machines for peeling oblate fruits and more particularly oblate tomatoes .

Machines to peel oblate fruits are already known, wherein the fruits are introduced into a collapsible tube through its inlet extremity and the cross section of the tube is caused to contract progressively from inlet end to the other in such a way that the fruits therein are gently compelled out of exit extremity of the tube. While the fruit is being compelled out of the tube, its peel is retained within the same, as the friction between the inner wall of the collapsible tube and the peel is greater than the adherence of the peel to the body of the fruit. A machine of this type has been already disclosed in Carpentieri Italian Patent No. 295,657.

Moreover, Carpentieri's U. S. A. Patent No. 2,164,384 provides a machine of this type, wherein the fruit is compelled out of the tube by means of gas pressure acting on the external surface of said collapsible tube. Means are provided therein to automatically feed the fruits to a rotary peeling device, and means to position the fruits in the device before they are grasped by the collapsing tube.

Furthermore, applicant's Italian Patent No. 345,118 discloses a machine of the same kind, wherein oblate fruits are cut automatically at one end, in order to facilitate the peeling operation, the fruits are fed to the peeling device proper by means of an aligning conveyor belt and a rotary fruit allotter or distributor, which is interposed between said conveyor belt and said rotary peeling device. Said fruit allotter or distributor comprises a rotary drum provided with radial cylindrical recesses or sleeves, wherein fruits coming from said aligning conveyor belt are lodged and then discharged after a predetermined angular movement of said drum in corresponding radial cylindrical recesses or sleeves of a rotary peeling drum. The motions of allotter and peeler are rendered synchronous by suitable transmission means.

All these known devices are faulty in many respects and principally they are subjected to the following disadvantages:

1. The fruits or tomatoes to be peeled are fed irregularly to the peeling device, and, therefore, a number of fruit or tomatoes fall out of the same.

2. The fruits or tomatoes to be peeled are often wrongly positioned in the peeling tubes, which results in an incomplete or failing peeling operation.

3. The peels remains adherent to the peeling tubes obstructing the same and disturbing the device's operation.

4. A synchronous inflation and deflation of the peeling tubes, according to the two last mentioned patents, cannot be ensured by the means disclosed in said patents.

5. The knife (blade) which is provided by said Messinese's Italian Patent No. 345,118 becomes unusable very soon because of the fruit or tomato peels which become entangled with it.

My invention eliminates such defects and provides other advantages, which will appear from the progress of this specification.

According to my invention, an oblate fruit peeling machine comprises in combination a feeding device, means for collecting fruits which are rejected from said feeding device, a rotary allotter or distributor provided with a device for cutting off one end of said oblate fruits, a cleaning device for said cutting device, a rotary peeling device provided with a device for cutting off the other end of said oblate fruits, a cleaning device for the cutting device last mentioned, a plurality of cylindrical sleeves on said allotter and on said peeling device, a collapsible tube arranged within each of said cylindrical sleeves and connected at its edges to the edges of said cylindrical sleeves, means for introducing a fluid in the annular space between the inner walls of said cylindrical sleeves and the external wall of said collapsible tubes in order to inflate the same, means for collecting the peeled fruits expelled from said tubes provided on the peeling device, means for deflating said inflated tubes, means for cleaning the inner wall of said peeling device deflated tubes and for expelling the peels therefrom, means for collecting said expelled peels.

Moreover my invention includes means to position the oblate fruits or tomatoes within a number of tubular containers provided in said rotary allotter or distributor, in order to maintain said fruits or tomatoes with their longitudinal axis inclined towards the edge of the allotter knife, and means to position the oblate fruits or tomatoes within said peeling collapsible tubes of the peeling device, in order to maintain said fruits or tomatoes with their longitudinal axis inclined towards the edge of the peeling device knife.

These and other novel features will be particularly described and ascertained in the following detailed specification.

A structure for carrying out my invention is disclosed in the accompanying drawings.

Fig. 1 is a side view of an oblate fruit peeling machine according to one embodiment of my invention.

Fig. 2 is a side view of a detail of the conveyor belt feeding device.

Fig. 3 is a plan view of the detail shown in Fig. 2.

Fig. 4 is a side view of the whole of said conveyor belt feeding device, with some parts omitted for clearness.

Fig. 5 represents a detail of the discharge end of the feeding device of Fig. 4.

Fig. 6 is a plan view of the feeding device of Fig. 4.

Figs. 7, 8, 9, 10 illustrate in longitudinal section some operative details of a cylindrical recess or sleeve provided with a collapsible and inflatable gripping tube.

Fig. 11 illustrates a detail wherein a tomato is positioned in respect of a cutting device.

Fig. 12 is a plan view of the cutting device of Fig. 11.

Fig. 13 is a modification of the cutting device of Fig. 12.

Fig. 14 is a radial section along the line XIV—XIV of Fig. 15, and illustrates a rotary drum provided with cylindrical recesses or sleeves and with a cutting device.

Fig. 15 is a side view of the device shown in Fig. 14, partially in section along the line XV—XV of Fig. 14.

Fig. 16 is a sectional view of allotter fluid distributor.

Fig. 17 is a front view of a part of the said allotter fluid distributor.

Fig. 18 is a front view, partially in section, showing a cutter device and the cooperating portion of a rotary drum.

Fig. 19 is a horizontal section along the line XIX—XIX of Fig. 18.

Fig. 20 is a detail of the device illustrated in Figs. 18 and 19.

Figs. 21 and 22 are similar to Figs. 16 and 17, and illustrate details of peeler fluid distributor.

With reference to the drawings, which illustrate one embodiment of my invention, the peeling machine comprises a frame 1, which supports by means of a bracket 2 a plate 3 which has upturned side edges 4, intended to receive oblate fruits or tomatoes put thereon at random by the operator. The fruits are taken by a conveyor belt 5, which passes on a roller 6 which is fastened to bracket 2 and on a tension roller 7 which is moveable in a guide 8 provided on said bracket 2 and positionable thereon by means of a positioning screw 9. As shown in Figures 4, 5 and 6, towards the discharging end of conveyor belt 5, two channels 10 and 11 are formed by means of deflecting walls 12, 13 and 14 which prosecute in guiding walls 15, 16 and 17. The breadth of channels 10 and 11 is so proportioned that only one oblate fruit or tomato can pass through each channel at a time, but even the smallest fruit or tomato cannot assume a transverse position. In other words, the channels are larger than the largest fruit to be peeled and less large than the maximum length of the smallest fruit to be peeled.

The conveyor belt 5 is smooth in order to permit the train of aligned fruits 18 to slide thereon, i. e. to stop, when they find a mechanical resistance to advancement.

At the discharge end of conveyor belt 5 a quick-

ly rotating roller 19 is provided (see also Figs. 2 and 3), which advances fruits 18 towards an oscillating stop blade 20 provided with a freely rotating roller 21. One stop blade 20 is provided for each channel 10, 11. The blades 20 are fastened on a shaft 22, which has a nose 23 at one end, cooperating with a double cam 24 mounted on a shaft 25. This shaft 25 is continuously rotated by a sprocket wheel 26, which is driven by a chain 27. On the same shaft is keyed a pulley 28 driving through a belt 29 a pulley 30 keyed on said roller 19.

The shaft 25 drives through a sprocket wheel 31 a second conveyor chain 32 formed with transverse ledges 33, which are of such shape to provide two fruit channels 34 and 35, in prosecution of channels 10 and 11. A plurality of oscillating blades 36 are interposed between a number of ledges 33, in order to provide in the channels 34 and 35 a plurality of receptacles. The oscillating blades 36 have a counterweight 37 (Fig. 5) which causes the blades to stand upright during the travel of chain 32 from one of its sprocket wheels 31 to the other 38. When the counterweights 37 of blades 36 reach the end of the upper travel length of chain 32, they meet a fixed cam 39 which causes the blades 36 to incline as indicated by dash lines in Fig. 5.

The roller 6 is driven by shaft 25 by means of a sprocket wheel 40, a chain 41 and a sprocket wheel 42. In turn, as already quoted, shaft 25 is driven by chain 27, which cooperates with a sprocket wheel 43, keyed on the shaft 170 of sprocket wheel 38. Shaft 170 receives its motion from said chain 27, which is driven by the sprocket wheel 44 mounted on frame 1 and driven by the engine belt 45 through pulley 46, sprocket wheel 47, chain 48, sprocket wheel 49, sprocket wheel 50 and chain 51.

The motion of described elements is therefore synchronous to the motions of other moving parts of the peeling machine.

Above the channels 10 and 11 a bridge 52 is provided which limits the maximum height of fruits or tomatoes to be peeled. Another bridge 53 is provided towards the discharge end of conveyor chain 32, carrying a leaf spring 54, which cooperates in aligning the fruits or tomatoes in the channels 34 and 35.

The fruits leaving the discharge end of conveyor 32 fall into a funnel 55 comprising a fixed part 56 and an oscillating part 57, which is pivoted in 58 on said fixed part 56. When a fruit 18 (see Fig. 4) falls into the funnel 55, it passes freely through the same only when a cylindrical recess 59 (see Fig. 1) is just under the funnel. However, if a cylindrical recess is not exactly positioned beneath the funnel 55, the fruit is repelled by the edge of said recess and pushed forward. Then it meets the movable wall 57 of the funnel, pushes it forwards and passes in a chute 60 which conveys the fruit to a funnel or sleeve 61 made of fabric or of a similar material, wherefrom it falls in a collecting trough 62.

In order to correctly guide fruits which don't exactly meet the upper opening of a cylindrical recess 59, a sheet metal shield 63 is provided around a rotary allotter or distributor 64, which will be later described.

I have found by experience that a good peeling of an oblate fruit or tomato requires that the same be firstly cut not only at one but at both ends, in order that the peel may be slipped off as a sheath. Moreover, as far as oblate tomatoes are particularly concerned, it is known that they

present one end which is hard and strongly attached to the pulp, and which prevents a perfect peeling operation.

In order to avoid this difficulty, I have provided my peeling machine with two cutting devices which act separately on the two ends of the fruit or tomato, with the object of ensuring an easy removal of the peel from the pulp.

According to my invention the machine is provided with a rotary allotter or distributor 64, fitted with a cutting device 65 apt to cut off one of the ends of an oblate fruit or tomato, and with a rotary peeling device 66 fitted with a similar cutting device 67 apt to cut off the other end of said fruit or tomato. The rotary allotter 64 is journaled in a large bearing 68 formed in the frame 1, and to a stump axle 112 fixed in frame 1 by means of a screwed end 113 and fastening nuts 114 and 115. Allotter 64 comprises a rear cylindrical boss 71 cooperating with an axially movable plate 69 (Figures 15 and 16) provided with an annular ridge 70. The body of allotter 64 comprises a drum 72, the inner face of which is axially channelled, in order to prevent adherence of fruit or tomato peels thereto. A double range of cylindrical recesses or sleeves 59 is provided on the rotary drum 72 of allotter 64. Sleeves 59 comprise a cylindrical rigid wall 73 provided with ridges 74 on its inner surface as shown in Figures 9 and 10. Sleeves 59 are furthermore fitted with a bottom flange 75, which is apt to be screwed in a corresponding lodgement 76 (see Fig. 18) provided in the drum 72. Said lodgement 76 merges with a bore 77 through a shoulder 78. A bottom edge 79 of a collapsible tube 80 is tightly held between said bottom flange 75 of sleeve 59 and said shoulder 78 of bore 77. The sleeve 59 is furthermore provided with a top flange 81 which cooperates with a screwed ring 82, which is apt to tightly secure the upper edge 83 of collapsible tube 80 between said top flange 81 and inner flange 84 of said ring 82. The space 85 formed between the rigid wall 73 of sleeve 59 and yielding wall of collapsible tube 80 is tightly sealed, and can be therefor inflated with a fluid which may be a liquid or preferably a gas. Said fluid is introduced through the port 86, which is provided in the wall 73 of sleeve 59 (see Figures 7, 8, 9, 10 and 14). Gas or liquid is furnished to said space 85 through said bore 86, a conduit 87, and a passage 88 formed in the rear wall 89 of drum 72.

Although I propose employing any sort of fluid, i. e. gas or liquid, to inflate spaces 85 and cause tubes 80 to collapse, I prefer using a gas, as air, which can always be easily obtained and does not require any particular or complicated means to prevent leakage. In the embodiment of my invention here disclosed I will therefore refer only to employment of air as inflating means.

Pressure air is supplied from a suitable source, for instance a compressor. As two different air pressures are required in operating my peeling apparatus, I prefer to produce a relatively elevated air pressure, employ the same directly in a suitable operative stage, and diminish said pressure through a reducing valve for another operative stage. As will be exposed in the following description, high pressure air is required to compress fruit or tomato out of the peeling tubes, while low pressure air is required to grip and firmly hold fruit or tomato during end cutting operations. Compressor and reducing valve plant, which may be of a conventional design, are not

shown in the drawing in order to simplify the same.

As for deflation I cannot rely upon the natural resilience of collapsible tubes 80, which are preferably made of india rubber or a similar material, the machine is provided also with an air aspirator or exhaust fan, not illustrated in the drawing.

Collapsible tubes 80 of allotter 64 require only low pressure air and suction, while collapsible tubes 80 of peeling device 66 require low pressure air, high pressure air and suction.

Referring to figures 15, 16 and 17, low pressure air is supplied through pipe 90, connection channel 91, and groove 92 formed in front face 93 of said axially moveable plate 69. Suction is lead through pipe 94, connection channel 95 and groove 96. Moveable plate 69 is urged towards front face 97 of said boss 71 by means of two compression springs 98 and 99 lodged in depressions 100 and 101 of frame 1 and in depressions 102 and 103 formed in lugs 104 and 105 of said axially moveable plate 69. Passages 88 above mentioned open in the front face 97 of boss 71 at equal angular distances. In the embodiment shown there are six passages 88 corresponding to the six pairs of sleeves 59 of allotter 64. Fig. 17 shows the angular position of openings 106, 107, 108, 109, 110 and 111 of the six passages 88 relative to said grooves 92 and 96 formed in the front face 93 of said axially moveable plate 69.

As already mentioned, inside the allotter rotary drum 72 a cutting device 65 is provided, which is shown more particularly in figures 11, 12, 18, 19 and 20, and comprises a hub 116 freely mounted on stump axle 112, which is formed with two arms 117 carrying a cylindrical plate 118 and a knife 119. The cutting edge 120 of knife 119 is some millimetres more distant from stump axle 112 than the rear edge 121 of said cylindrical plate 118. Hub 116, arms 117, plate 118 and knife 119 are freely oscillating on stump axle 112. As shown in figs. 18 and 19, stump axle 112 carries a fixed plate 122, which has a lug 123 connected by means of a compression spring 124 with a lug 125 provided on one of the arms 117 above mentioned. Hub 116 is formed with an arm 126 provided with an eye 127 cooperating with a knob 128 formed on a lever 129. Lever 129 is a double armed one and its second arm 130 engages with a knob 131 a cam 132 formed with notches 133 provided on the rear wall 89 of drum 72. With the parts in the position illustrated in fig. 18, double armed lever 129, 130 which is pivoted on the pivot 134 carried by said plate 122, is in alignment with said eyed arm 126, and knob 131 is lodged in one of the notches 133 formed in cam 132. When drum 72 rotates in direction shown by arrow A, lever 129—130 is oscillated and therefor arm 126, arms 117, plate 118 and knife 119 are caused to make a little angular movement or oscillation counter-clockwise, against the action of compression spring 124. As soon as another notch 133 comes into cooperation with knob 131, the latter suddenly snaps into said notch and the lever 129, 130, arm 126, arms 117, plate 118, knife 119 assume again the position shown in fig. 18.

Plate 118 and knife 119 may assume some other conformations, as shown for instance in figures 11, 12 and 13.

In order to keep clean the inner face of drum 72, which is channeled as already mentioned, a rotary brush 135, mounted on said plate 122, is provided. The rotary brush is driven by a

toothed inner crown 136 formed in drum 72, through gears 137 and 138.

Beneath allotter 64 now described, a similar device is provided, comprising a rotary peeler 66. This peeler is of a construction identical to that of allotter 64, as illustrated in figures 14 and 15. A particular description of peeling device 66 is therefore omitted. Moreover, peeler 66 is provided with a cutting device 67 which is exactly similar to cutting device 65 of allotter 64, as particularly illustrated in figures 11, 12, 13, 18, 19 and 20. For the same reason, no particular description of cutting device 67 is given.

The only difference between allotter 64 and peeler 66 consists in the air control device. The latter is illustrated in figs. 21 and 22. The same reference numbers have been employed in figs. 21 and 22 to indicate the same parts as illustrated in figs. 16 and 17. As the peeling device has to be supplied with low pressure air, high pressure air and air suction, axially moveable plate 69 is provided with three grooves 139, 140, 141 corresponding to connection channels 91, 142 and 95. Channels 91, 142 and 95 communicate with supply pipes 90, 143 and 94 respectively. Low air pressure is furnished through pipe 90, connection channel 91 and groove 139. High pressure air is led through pipe 143, connection channel 142 and groove 140. Air is exhausted through pipe 94, connection channel 95 and groove 141. Other parts of this air supply arrangement are exactly equal to those already described in connection with allotter 64 and with reference to figs. 16 and 17.

The peeler 66 is provided with a peeled fruit or tomato discharge chute 144 cooperating with a collecting trough 145, and with a peel discharge chute 146, which leads peels to some receiving tray, not illustrated at it does not constitute a part of this invention.

In order to drive allotter 64 and peeler 66, a Geneva gear is provided for each of these devices, as illustrated in figs. 16 and 17. A chain 147 connects two sprocket wheels 148 (only one of which is illustrated in figs. 16 and 17), which are keyed on axles 149 of a control member 150 of said Geneva gear. Axle 149 is journaled in frame 1. Control member 150 is provided with a knob 151 engaging indentations 152 of Geneva driven member 153. In order to secure an absolutely synchronous motion and positioning of allotter 64 and peeler 66, a toothed wheel 154 is provided on each of said two devices, and a gear wheel 155 is journaled on a bracket 156 of frame 1 and engages said two wheels 154.

By this way allotter and peeler are driven and connected by means of two separate transmission gears, i. e. a transmission gear comprising said two Geneva motions and connecting chain 147 and a transmission gear comprising said two toothed wheels 154 and toothed wheel 155. Consequently, dead motions are done away with in a substantial manner and a smooth operation is ensured. Said transmission gears are driven by belt 45, through pulley 46, sprocket wheel 47, chain 48, sprocket wheel 49, and suitable gears of conventional design (not illustrated in the drawing) provided between sprocket wheel 49 and said transmission gears.

In operation, oblate fruits or tomatoes are scalded as commonly used in the preparation of peeled tomatoes, in order to diminish natural adherence between peel and pulp. This scalding operation is preferably accomplished in a scalding machine of conventional design. The scalded

fruits or tomatoes 18 are manually or mechanically put on plate 3 (Fig. 1) and pushed on smooth conveyor belt 5. Fruits or tomatoes are advanced by belt 5 and gently introduced into channels 10 and 11, where they become aligned in an ordered succession. In prosecution of conveyor belt 5, as already disclosed, there is a conveyor chain 32 provided with ledges 33 which form two channels 34 and 35, wherein oscillating blades 36 are provided in order to build up a number of receptacles. Chain 32 is operated with such a speed that the frequency of passage of said receptacles is the same as the frequency of passage of cylindrical sleeves 59 of rotary devices 64 and 66. In other words chain 32, allotter 64 and peeler 66 are synchronously operated.

Fruits or tomatoes 18 are allowed to pass from conveyor belt 5 to conveyor chain 32 only when a receptacle is in front of the discharge end of belt 5. When a receptacle is not in such a position, and therefore it is not desirable that a fruit or tomato pass from belt 5 to chain 32, then cam 24 lifts up blades 20 acting on lever 23 and axle 22. Tomatoes or fruits are then stopped by inclined blades 20, because belt 5 and quick rotating roller 19 already described are not able to cause fruit or tomato to surmount the slope provided by inclined blades 20.

Freely rotating rollers 21 have the purpose of diminishing friction on the blades 20.

By this arrangement, fruits or tomatoes are regularly lodged in the receptacles of conveyor chain 32, independently of their size.

Fruits or tomatoes are then poured through the funnel 55 into a pair of cylindrical recesses or sleeves 59 mounted on allotter 64. At this time, collapsible tubes 80 contained in said cylindrical sleeves 59 are completely deflated as the space 85 between tubes 80 and rigid sleeves 73 is connected with exhaust pipe 94 through channel 88, groove 93 and connection channel 95. As soon as allotter rotates clock-wise, by means of Geneva motion gear 150, 153 to reach a new position wherein another pair of sleeves 59 come into cooperation with said funnel 55, connection of aforesaid space 85 with groove 93 is broken and a new connection with groove 92 is established. Therefore, space 85 is filled with low pressure air, tube 80 is pneumatically collapsed and the fruit or tomato firmly grasped by collapsible tube 80. One of the ends of fruit or tomato protrudes into drum 72 through bore 77 by a length determined by cylindrical plate 118, already described. Continuing its rotation, allotter 64 carries the grasped fruit or tomato against and beyond the cutting edge 120 of knife 119, so that one end of fruit or tomato is cut off and falls in the inside of drum 72. The cut ends collected in the drum 72 are manually or mechanically removed in a conventional manner.

In order to avoid that fruit ends or bits of peel become entangled with the cutting edge 120 of knife 119 during continuous operation of allotter, the plate 118 and the knife 119 are intermittently oscillated by means of cam 132 and levers 129, 130 and 126, as already described. This intermittent oscillation shakes off any residue of peel or fruit end from the knife edge 120.

Owing to the natural softness of fruits or tomatoes, if the latter were axially held by collapsible tubes 80 they would lean backwards upon contact with the cutting edge of the knife, in such a manner that the cut would result a biased one relatively to the longitudinal axis of fruit or tomato. This would produce a tomato or fruit

having an unpleasant aspect and therefore a lessened commercial value.

In order to obviate to this defect, I provide the sleeves 59 with an inclined wall 157 (see Figs. 7 to 10) which obliges the fruit to assume a position slightly inclined towards the cutting edge of the knife. By this means a perfect cut at right angles to the longitudinal axis of fruit or tomato is obtained. Figs. 7 and 8 show two phases of grasping operation of collapsible tube, Fig. 7 illustrating low pressure inflation of tube 80, as suitable for edge cutting operation, and Fig. 8 illustrating high pressure inflation as suitable for peeling operation. Fig. 9 shows the form assumed by tube 80 as soon as the peeling operation has been accomplished and the tube is still inflated with high pressure air. Fig. 10, on the contrary, shows the same tube 80 after deflation and air suction.

When sleeves 59 of allotter 64 reach their lowermost position, tubes 80 are deflated because the channel 38 is now connected with suction groove 95 of plate 69, and remain in such deflated condition until they reach their uppermost position again, in which position sleeves 59 are again ready to receive fruits or tomatoes from canal 55.

In this lowermost position sleeves 59 of allotter 64 are in correspondence with sleeves 59 of peeling device 66. Collapsible tubes 80 of peeler sleeves 59 are also deflated, their conduits 88 being now connected with exhaust groove 141 above mentioned. The fruits or tomatoes cut at one end contained in lowermost sleeves of allotter then fall into uppermost sleeves of peeler. They will be grasped by tubes 80 of peeler sleeves and cut at their other end, which is now protruding into the drum 72 of peeler 66. Fruit or tomato ends are now cut in the manner explained above, and then high pressure air is admitted to spaces 85, when peeler sleeves rotate and proceed towards their extruding position, which is indicated by B in Fig. 1 of the drawing.

High pressure air is admitted to spaces 85 through high pressure air pipe 143, connection

channel 142 and high pressure air groove 140. Tubes 80 then become more inflated and expell the fruits or tomatoes which are peeled during and by this extruding operation.

5 The peeled fruits or tomatoes fall into the chute 144 and are collected in the trough 145, whence they are removed in any conventional manner. Peels remain in the tubes 80 and fall therefrom when sleeves 59 reach their lowermost position.

10 In order to ensure the exit of the peels from the tubes 80, to which they may adhere, and to clean said tubes from juice or seeds, a brush 158 carried by an alternating rod 159 which is slidable in bearings 160, 161 formed on a support plate 162 fastened to said frame 1 is provided. Rod 159 is hollow in order to let a jet of water be projected axially and radially from the brush 158. Water is supplied to rod 159 through a supply pipe 163 and a control valve 164. The brush 158 is introduced into sleeves 59 when they are in rest position C (Fig. 1). As already explained, peeler 66 rotates with an intermittent motion due to said Geneva gear transmission.

25 Brush 158 is intermittently actuated by a cam 165 acting on a rod 166 provided with a compression spring 167 and connected to said rod 159 by means of a cantilever 168 fulcrumed at 169 on the machine frame 1. Water, peels and other residues are carried away by means of the chute 146.

30 Preferably, collapsible tubes 80 are predisposed to collapse in such a way to form longitudinal folds, in order to firmly grip the peel of fruits or tomatoes when the latter are extruded and peeled. To this end ribs 74 are formed on the inner wall 73 of sleeves 59 which maintain the predetermined shape of tubes 80.

35 If a fruit or tomato is not peelable, owing to the fact, for instance, that it is too sour, it will not be extruded in position B and then will fall out of peeling tube when this is deflated in its lowermost position.

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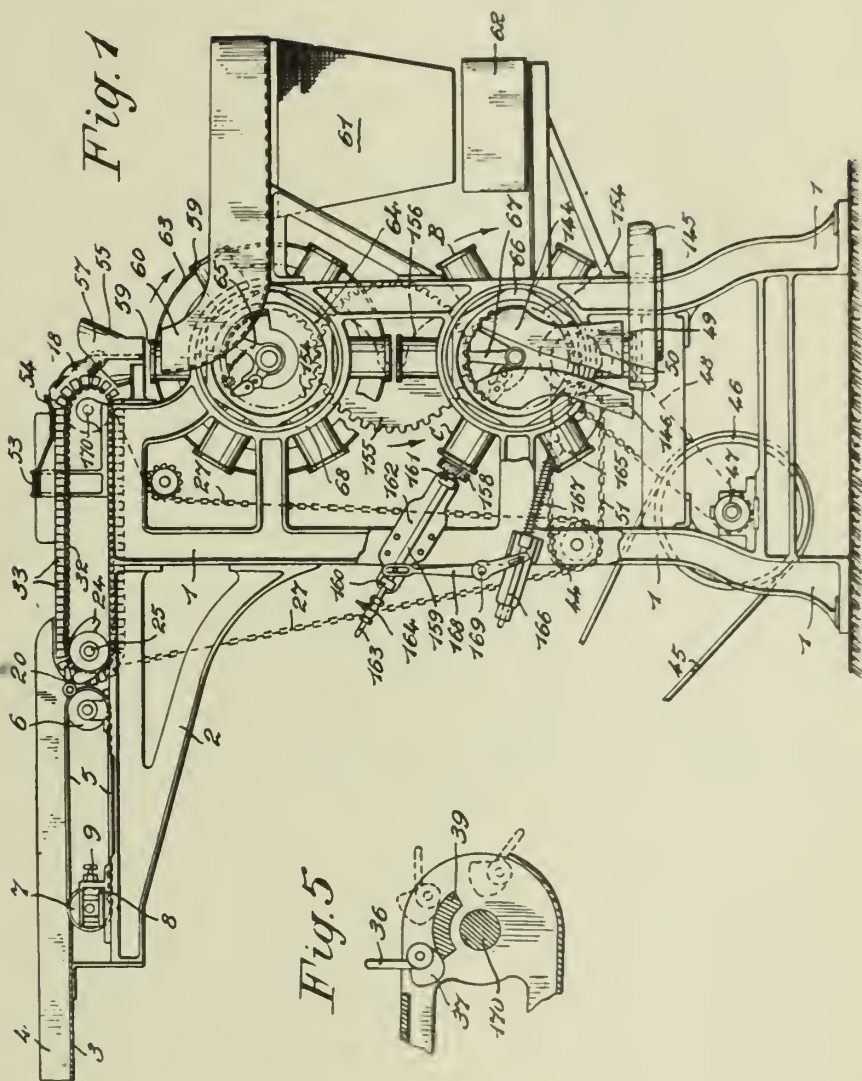
OBLATE FRUIT PEELING MACHINE

Filed Sept. 30, 1940

Serial No.

359,123

7 Sheets-Sheet 1



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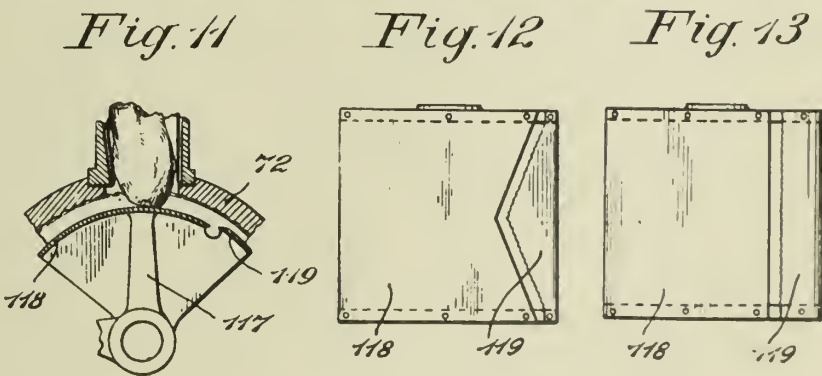
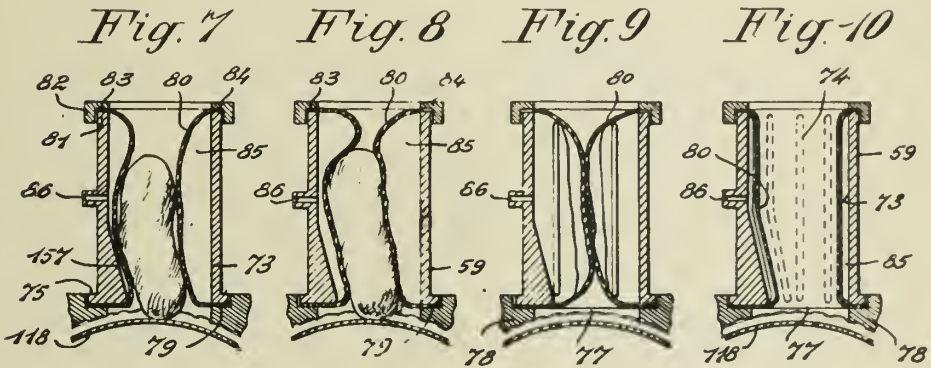
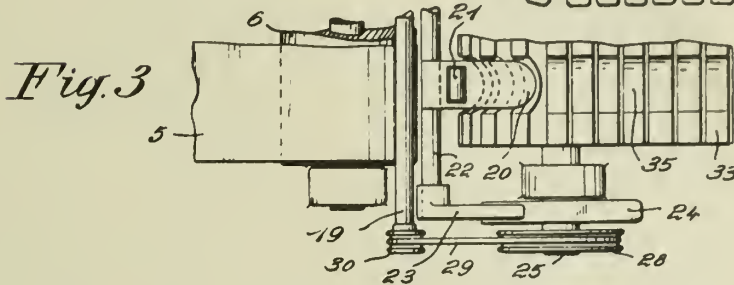
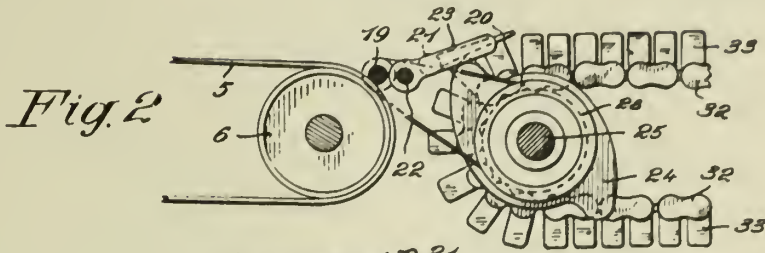
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OBLATE FRUIT PEELING MACHINE

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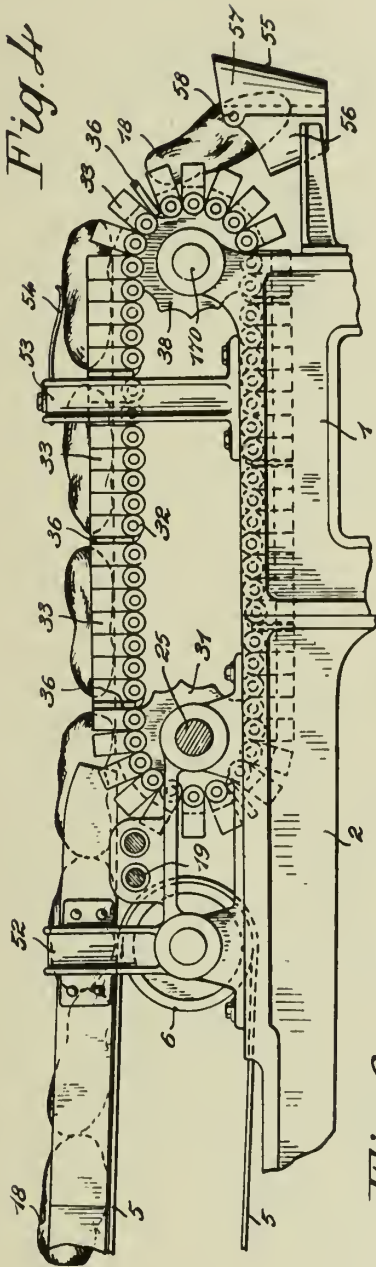


Fig. 4

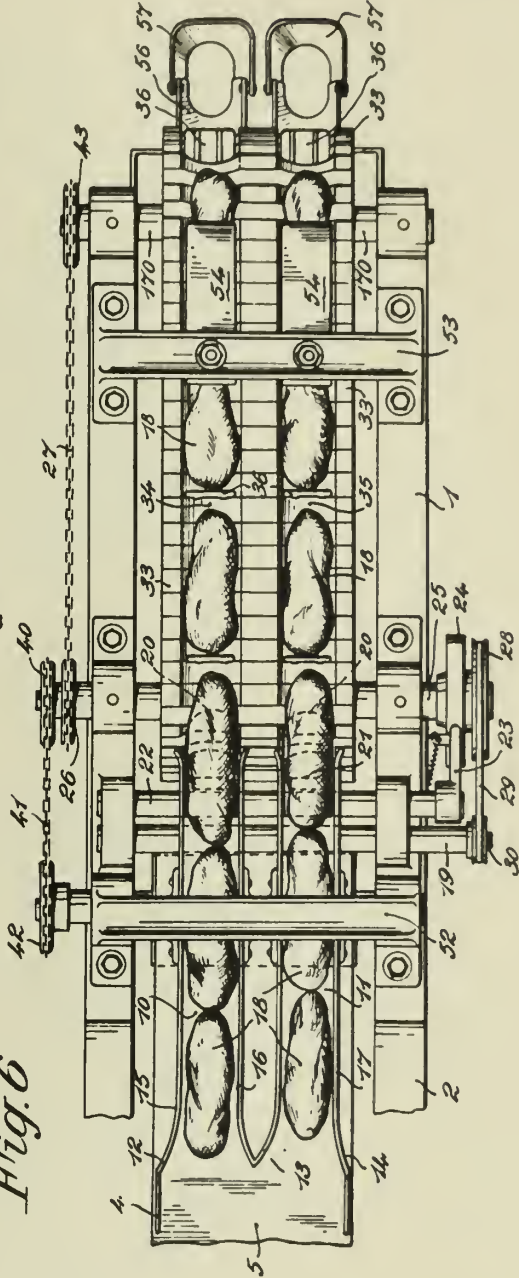


Fig. 6

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Fig. 15

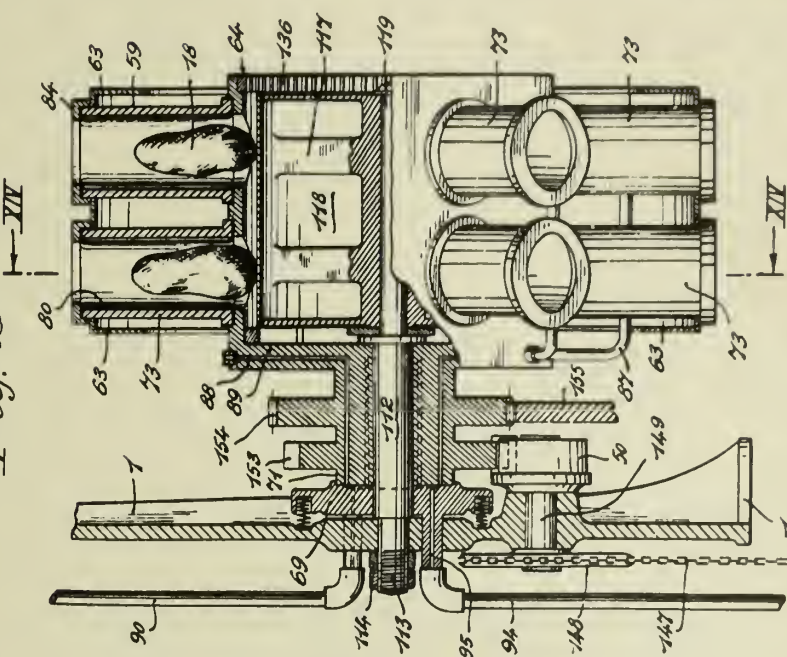
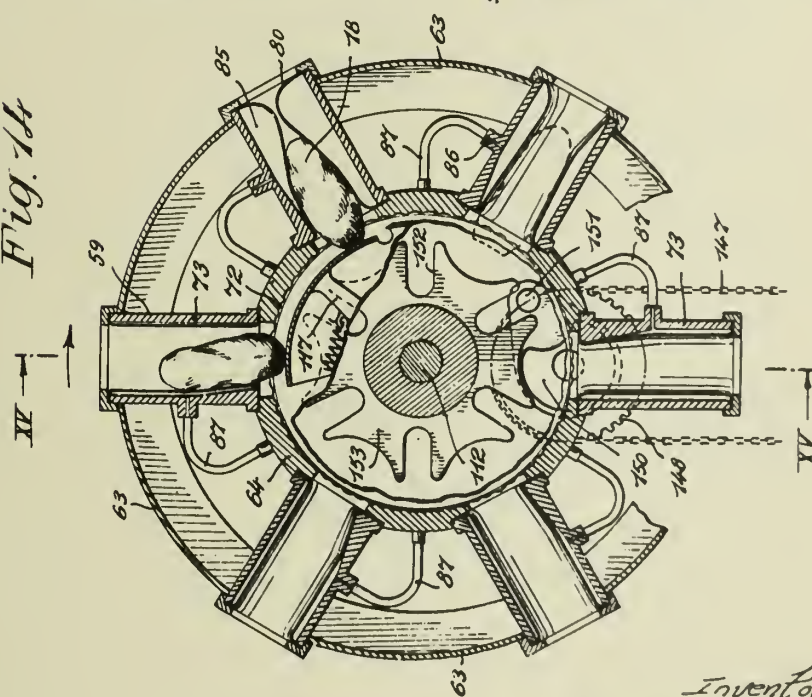


Fig. 14



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Fig. 17

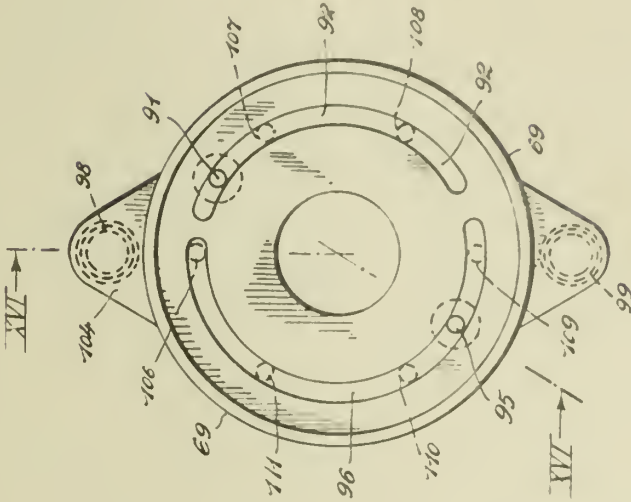
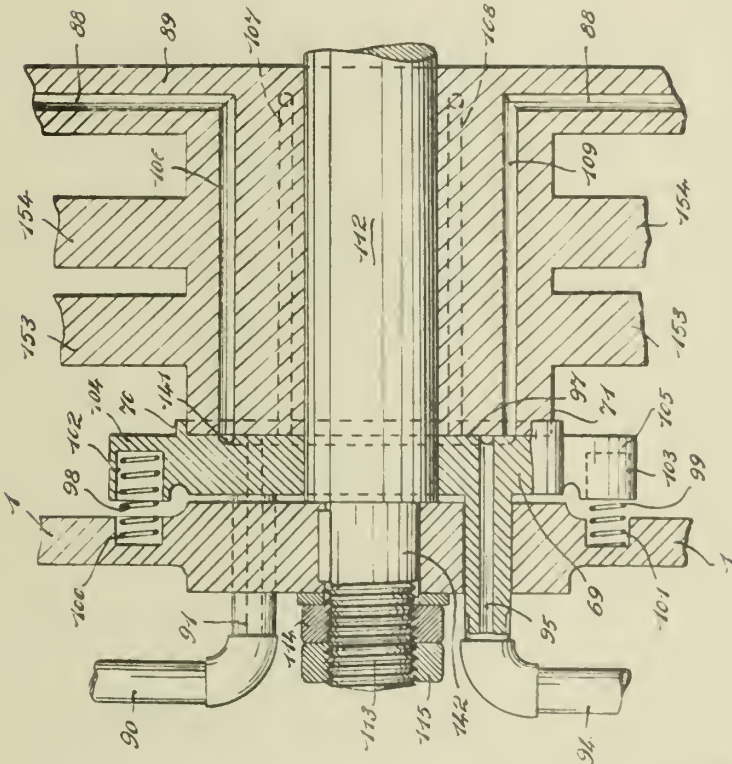


Fig. 16



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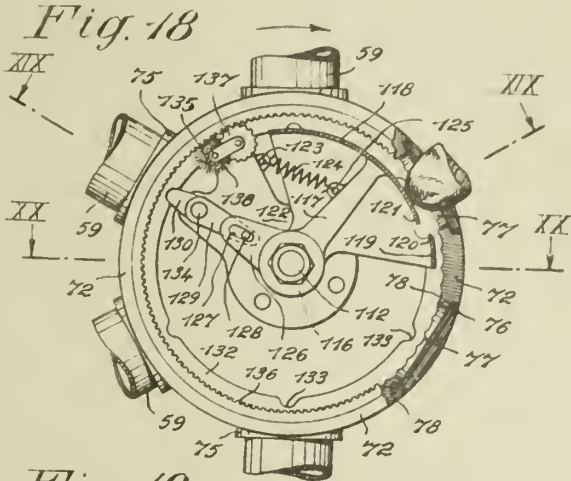
OBLATE FRUIT PEELING MACHINE

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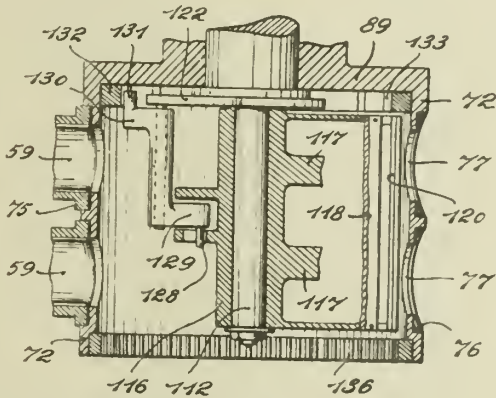
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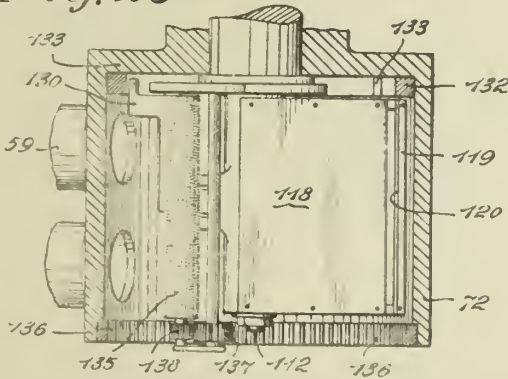
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*Fig. 19*



*Fig. 20*



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Fig. 22

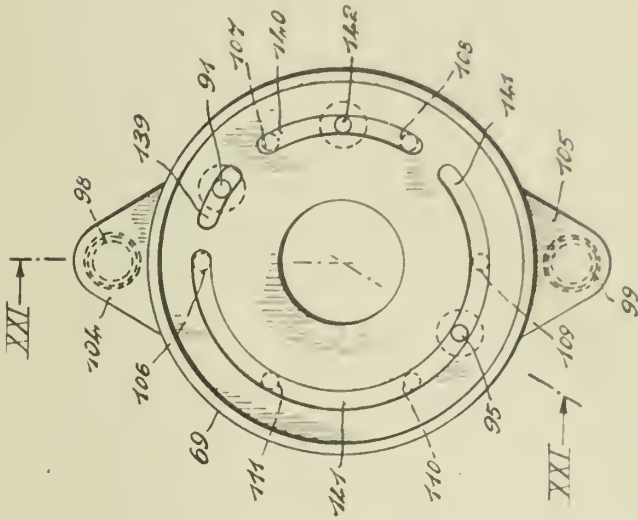
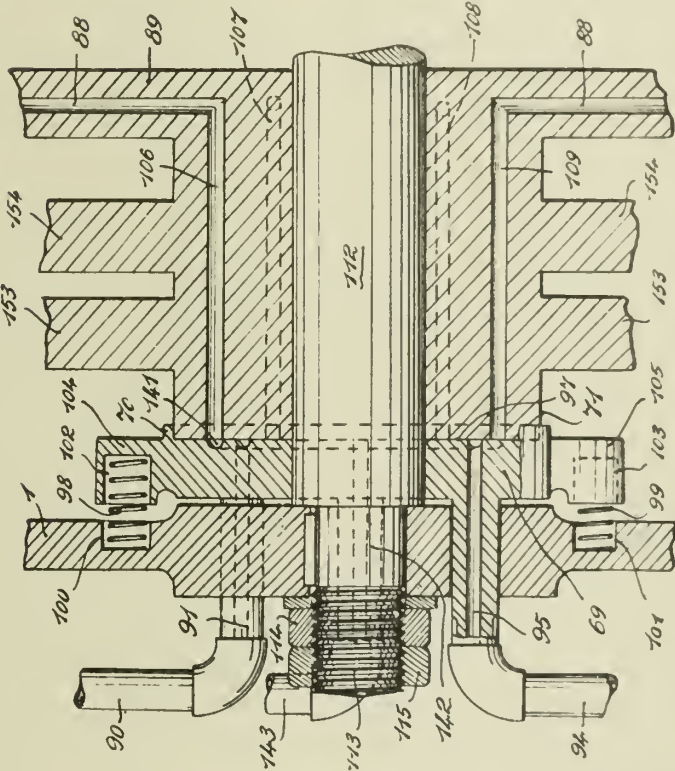


Fig. 21



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# ALIEN PROPERTY CUSTODIAN

## PROCESS OF ADSORBING GASES AND VAPORS

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Application filed October 8, 1940

The present invention relates to a process of adsorbing gases and vapors.

Spacious plants are necessary for selecting relatively small amounts of gas out of large quantities by adsorption by way of active carbon or silica gel, for instance for obtaining 2 per cent of ethylene from coke oven gas, without decomposing the main portion of the gases; In consequence thereof said plants only work with relatively large losses of energy. The adsorption of higher amounts of gases by a cooling process is not only rather uneconomical with regard to the costs of energy, but it also requires prolonged change-over-periods. If, on the other hand, the main gas portion which often comprises 98 per cent of the total gas portion is not required in the compressed state, the application of pressure for improving the adsorption would afford unreasonably high compression costs.

Now I have found that the afore-named drawbacks may be avoided by separating gases and vapors under pressure and at a low temperature within a cold gas machine, particularly by compressing the gaseous mixture, cooling it, thereby utilizing the temperature drop between the compressed initial mixture and the expanded gas, leading the cooled and compressed gas into adsorbers containing active carbon or silica gel, then causing the non-adsorbed components leaving the adsorbers to be cooled and expanded, thus supplying the low aforementioned temperature for cooling the initial mixture. According to the invention the coupling of the adsorbers with a cold gas system (cf. Schüle, "Technische Thermodynamik," 4th edition, volume 1, pages 171 et seq.) does not only allow a cooling in a simple manner of the gas and vapor entering the plant, but enables, by using an expansion engine, the cooling of the apparatus in a very simple and favorable manner from an economical point of view, while a large portion of the costs due to compression are recovered.

The invention is diagrammatically illustrated by way of example in the accompanying drawing.

The quantity of gas to be treated enters the plant through conduit I and is compressed by compressor A for instance to 4 atmospheres above atmospheric pressure. The heat of compression is eliminated by cooling water in condenser K. The total quantity of gas then enters a heat-exchanger W where it is cooled in counter-current to the gas discharged from the expansion engine. The cooled and compressed gas is then passed to the adsorber X which is charged for instance with active carbon. In said part of the

device the heavy hydrocarbons are adsorbed. Owing to the pressure applied and the low temperature the quantities of gases adsorbed are by far greater than in the usual adsorption plants.

5 The gas freed from heavy constituents, for instance coke oven gas freed from ethylene and other heavy hydrocarbons, is cooled, if necessary, by the heat of adsorption in a water cooler L to which it is passed and then expanded to about 10 normal pressure in an expansion device B. As the expansion is effected adiabatically a considerable temperature drop in the expanded gas is produced. The low temperature is utilized for the adsorption process by conducting the quantity of leaving gas through the heat exchanger W 15 in counter-current to the compressed initial gas and causing it to leave the apparatus at II. Since more work is consumed by compressor A than is furnished by expansion device B, both devices are suitably coupled and provided with an electro- 20 motor or another power engine C so that the missing output is recovered. If very large portions of gas are treated or if an excess of heat of any part of the apparatus exists it may be advisable to use the three machines A, B and C as 25 turbo-compressors or turbines and interconnected by suitable couplings.

After the adsorber X has been completely charged the main current of gas is changed-over 30 by hand or automatically to the discharged adsorber Y and the heavy hydrocarbons which have been separated are expelled from X. This operation may be performed first by an expansion of the adsorber X to a gasometer G. If it is intended to remove further quantities, heavy hydrocarbons already obtained may be removed 35 from the gasometer, for instance with a blast V, and moderately heated in a heating device E; the adsorber cooled by the expansion is thus heated until the discharge is complete. The stage of operating thus described is illustrated in the drawing by the second adsorbing device Y which must be actuated in alternation with the body X. In many cases it will be advisable to use a third 40 adsorber which after the removal of the ethylene is cold-blasted with the cooled gas (II) leaving the apparatus.

The ethylene thus obtained and the heavy hydrocarbons are eliminated from the apparatus 45 at III; they may be introduced into a plant of liquefaction. For saving the step of compression it may, therefore, be possible first to cause a compression of the pressure between the adsorber and the liquefaction plant, while initially avoiding the gasometer G. 50

There are still to be mentioned some further known steps which may serve as a simplification of the process. If readily condensing or freezing constituents are contained in the gas arriving, such as water, naphthalene or the like, two regenerators filled with accumulated material will be mounted in an alternating system instead of the main heat exchanger W. Furthermore it may be useful for the same reasons to install at different parts of the plant separators which may be changed-over, driers or the like. Finally the heating device E may be heated with waste heat coming from any part of the apparatus or from the additional driving machine C.

Finally it may in some cases be advisable to have the expansion machine B expanded on a pressure higher than the suction pressure, for instance for obtaining a pressure necessary for feeding a long distance gas pipe system or for carrying out any other subsequent process. According to the size of the plant and the operating conditions chosen compressor A, expansion machine B and additional power engine C may be piston engines, turbo-engines with mechanical, hydraulic or electric intermediate gears, C may be a steam engine, an electro-motor or a gas power engine.

When comparing it with the steaming method usual in the adsorption technic, the process of the present invention involves the advantage of saving steam and, above all, of excellently protecting the adsorbing agent, especially active carbon. The number of the adsorption bodies required can in general be reduced. The present process may be useful for the decomposition of coke oven gas or the like as well as for the separation of small percentages of reacted gases or vapors from mixtures obtained in catalytic processes using a circulating gas.

The economical value of the present process essentially depends on the fact not to produce any unnecessarily low temperatures by the application of unnecessarily high pressures. It has, therefore, to be endeavoured to adjust a low operating pressure in the cycle, while the temperature of the cooling water utilized in the cooler is likewise low. This is performed according to the invention by the application of a means known in the art and regulating the filling, said means being mounted at the expansion machine and being illustrated in the drawing by R. The fluctuations of the temperature of the cooling water occurring during the prolonged operations could be regulated by hand. But in the course of an operation fluctuations in the cold cycle likewise occur which depend on the fact that either the heat exchanger was just thawed off or a heated adsorber was changed-over. These fluctuations of temperature, too, may suitably be compensated by a temporary alteration of the operating pressure. The regulation of filling the expansion machine will, therefore, have to be made dependent on the temperature of the gas

introduced after having passed the heat exchanger and before the adsorption sets in, the operation being performed in such a manner that *pari passu* with the decreasing temperature of the gas which may be parallel with the decreasing temperature of the cooling water, the pressure is decreased, in other words the filling is increased and vice versa.

Many of the components to be obtained and present only in traces, such as ethylene, propylene and others are so intimately adsorbed by the adsorbing agent that, on merely expanding the charged body, the adsorbed, heavy constituents are set free not at once, but only after a prolonged time. Therefore, it will be suitable in such cases to effect the expansion of the charged body which has been taken out of the pressure cycle not by the way of the gasometer for the substances to be obtained, as large portions of inert gases, for instance methane or hydrogen, would dilute the substances obtained and impair the further treatment. After having been taken out of the pressure cycle the charged adsorber will, therefore, be expanded into the gas leaving the plant which is not under pressure and has been freed from the heavy constituents. Only after the expansion pure heated gas or a gas enriched with heavy constituents is blown from the gasometer through the adsorber in order to discharge it entirely. If the removed substances constitute mixture, for instance ethylene and propylene or "Gasol," i. e. a mixture of heavy hydrocarbons, it may often be preferable to use heated pure ethylene for discharging the adsorbing agent and to expel in the manner to a large extent the heavier components. In such a case that gas will be used for the removal which is the least adsorbed at the increased removal temperature and above all tends the least to undesired phenomena, such as polymerization on the adsorbing agent and others. For a careful treatment of the adsorbing agent it may furthermore be suitable once to steam it in known manner after each thirtieth or fiftieth discharge so as to remove entirely the residual charge with agents injuring the adsorption.

The present process enables to separate 1.5 per cent of ethylene from illuminating gas; the application of the entire quantity of gas according to the present invention shows surprising results. By means of mechanically readily attainable pressures, for instance 4 atmospheres above atmospheric pressure, and suitable active carbons selective for ethylene there may be obtained such quantities of gases adsorbed as amount to ten times the normal quantities. The discharge thus becomes economical and simple, since in the case of components of small percentages to be obtained and the small additional charges the energies of loss on changing become too large in the usual processes.

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MAY 18, 1943.

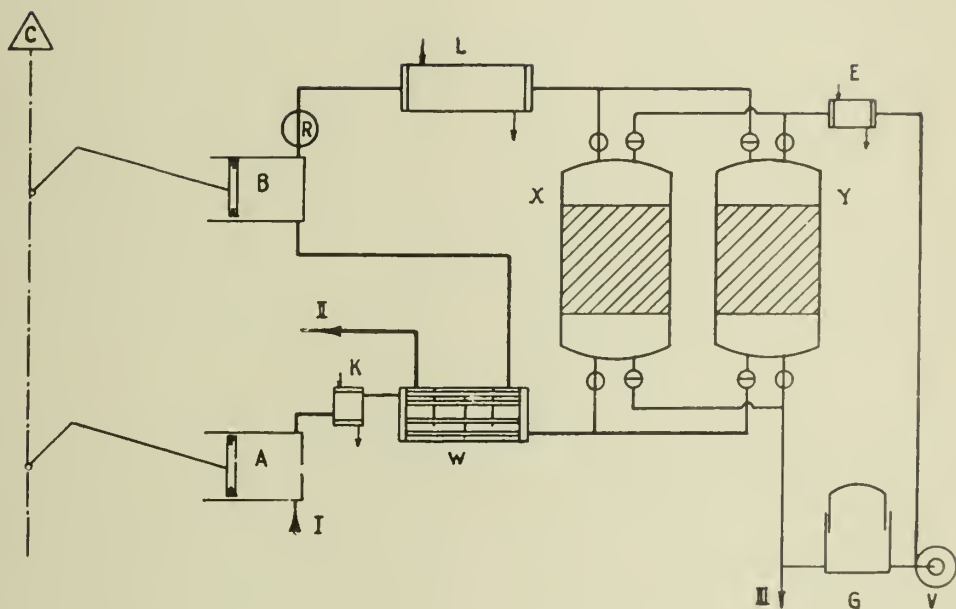
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## PROCESS OF ABSORBING GASES AND VAPORS

Filed Oct. 8, 1940

Serial No.

360,291



INVENTOR

BY *Hutz and Joslin*

HIS ATTORNEYS



# ALIEN PROPERTY CUSTODIAN

## ELECTRICALLY DRIVEN TOY VEHICLE OR MORE SPECIFICALLY A VEHICLE FOR ELECTRICAL TOY TRAINS

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the Alien Property Custodian

Application filed October 9, 1940

The invention concerns an electrically driven toy vehicle or more specifically a vehicle for electrical toy trains, which has a long distance steering apparatus operated through the changing of a switch-magnet by means of current contacts.

According to the invention registered under patent application Serial #269,797, serves for the utilization of the switch magnet an apparatus, which places the magnet while it is being switched under a current, which is stronger in case it is a constantly high plant pressure than the effective pressure from the running motor in the switch magnet. This raised current is obtained through the partially or completely forced to stop motor, to which is guided by means of a connection to the controller the entire plant pressure. The armature of the switch-magnet, which is only attracted while the change is in process, is under influence of a force created for example by a spring, a weight or something similar to this, which attempts to keep it in its inactive position and which force is greater than magnetic force exerted from the current moving the vehicle.

This switching apparatus gains in this patent a still greater perfection, in as much as it provides for a means, which stops the operation of the switch magnet while the motor is running. For such a checking device can serve a mechanical apparatus, which can for example prevent the swaying movement of the armature of the switch magnet while the motor is running or an electrical device, which will interrupt the circuit of the switch magnet while the motor is running by means of a contact device.

It is especially advantageous to regulate this checking device through the motor.

Through the invention it has been accomplished, that the switching can only be done when the vehicle is standing still. A detrimental feature, the heavy wear and tear on the parts because of accidental switching while moving has herewith been made impossible. Besides, inasmuch as the switching magnet has been turned off while the motor is running, a not wanted self-switching of the vehicle because of current interruptions while moving has been checked.

In Fig. 1 is the invention plainly visible in a diagram.

By itself moving vehicle, that is by a running motor flows the current from its source Q over the wire  $l^1$ , the controller R, the switch  $k^1$ ,  $k^2$ , the wires  $l^2$  and  $l^3$ , to motor M and over the wire  $l^7$  and back to the current's source Q.

If by still standing motor M should be switched, the result will be that, the contact  $K^2$  will be adjusted to  $k^3$  by bridging the controller R, and consequently have the highest general

plant pressure. The current flows from its source Q over the wire  $l^1$ , the contact points  $k^3$ ,  $k^2$ , the wires  $l^2$ ,  $l^4$  and  $l^5$  to the switch magnet S and over the wires  $l^6$  and  $l^7$  back to the current's source Q. The switch magnet becomes active, the armature A is attracted, also the connected switch apparatus, which for example might operate a switch roller.

To switch off the currents  $l^4$ ,  $l^5$ ,  $l^6$ , over the switch magnet S while the motor is running serves the lever H, which operates the switch L. As soon as the motor starts to turn itself, the lever H will escape and the switch L opened. The switch magnet S is turned off.

Fig. 2 shows the centrifugal force arrangement to interrupt the circuit of the switch magnet in accordance with the ideas brought forth in this patent.

a is the motor field, b the motor armature, c one as switch roller constructed switching arrangement and d the switch magnet, whose not sketched armature in itself rather well known pace switching apparatus which can change the switch roller c.

In the circuit of the switch magnet d is a contact device, which consists of the movable contact e and the fixed contact f. The contact enclosure will be insured by the spring i.

A centrifugal force arrangement g, which either lies on the shaft of the motor armature b or is connected with this by a mechanism. It moves, as soon as the motor armature turns itself, its parts due to the centrifugal force away from the center, while, however, the adjustable part h is pulled in the direction of h downward. The arm  $e^1$  of the contact lever e is also pulled away, and consequently the contact enclosure between e and f is interrupted. When the motor armature stops turning the spring i will see to it that the contact enclosure is once more made.

Another make-up is represented in Fig. 3. In this case one finds the movable contact e, the contact e, f on one so called friction lever K, which is on the shaft  $b^1$ , of the motor armature b or on one with this connected wave and with the turning of the shaft is forced along because of the friction. By the turning of the motor armature is the lever k taken along depending on the direction it is turned as far as the left or the right stroke  $m^1$  or  $m^2$ . Through which the contact arrangement e, f will be opened. By still standing motor the spring l guides the lever k back into the contact position.

The invention is not only applicable to switch arrangements like the original patent but is also usable for other long distance steering switch arrangements, which work through interchanging of the switch magnets under current pressure.

OSWALD FISCHER.



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BY A. P. C.

O. FISCHER  
ELECTRICALLY DRIVEN TOY VEHICLE OR MORE  
SPECIFICALLY A VEHICLE FOR  
ELECTRICAL TOY TRAINS  
Filed Oct. 9, 1940

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360,486

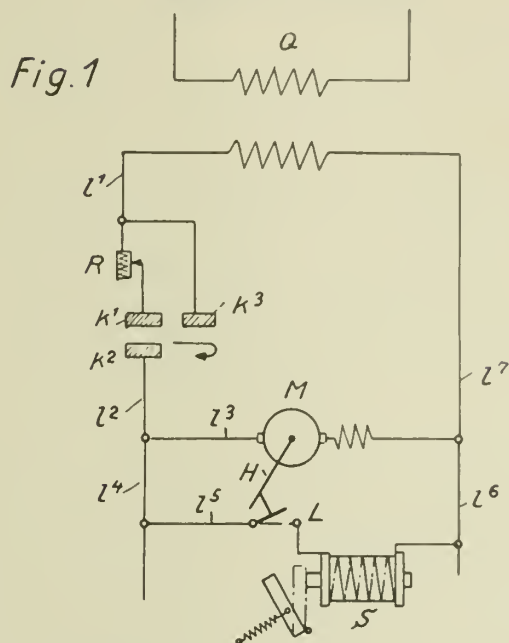


Fig. 2

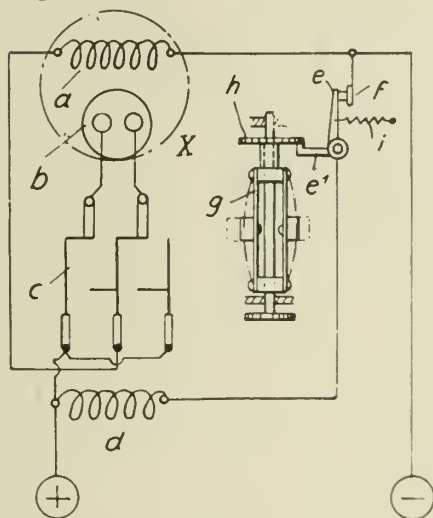
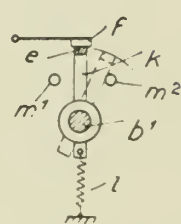


Fig. 3



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# ALIEN PROPERTY CUSTODIAN

## METHOD OF INCREASING THE INCLINATION OF VINYL ACETATE TO POLYMERIZE

Willy O. Herrmann, Deisenhofen, Hans Deutsch  
and Eduard Kalb, Munich, Germany; vested in  
the Alien Property Custodian

No Drawing. Application filed October 9, 1940

Vinyl acetate, polymerizable in general according to known methods, shows the peculiarity to be suitable very differently for the production of polymers. The cause of this fact lies in the different manners of the production and purification of vinyl acetate. Thus the inclination for polymerization at all and the degree of dispersion obtained by polymerizing in emulsion can be quite different. F. i. the part of vinyl acetate obtained by the technical production of this substance from the last runnings of the distillation of the raw material, cannot be polymerized in the usual polymerization equipment. It is necessary to apply extraordinary intensive methods of polymerization for it in order to obtain a course of polymerization somewhat satisfying and a middling degree of polymerization. Applying such products for the polymerization in emulsion, these disadvantages are to be seen most evidently in the fact that the obtained emulsions contain unusual large particles and therefore show a very defective stability. In many working periods such and similar difficulties also appear if employing vinyl acetate not obtained from the last runnings. In general the causes for this fact are not evident.

Now it has been found that all kinds of vinyl acetate, badly suited for polymerization, can be converted into well suitable ones by simple distillation with steam. After this distillation with steam the products are satisfying inclined for polymerization, and, above all, the emulsions obtain small particles and are therefore of good stability.

In many cases the distillation with steam stimulates the inclination for polymerization in such a manner that a more or less small part of the monomer polymerizes during the distillation. If desired, this premature polymerization may be prevented by adding any proposed polymerization inhibitors in such an amount that—according to the method of the application SN 337,552 filed May 27, 1940—the polymerization takes not place already during the distillation with steam but will not considerably inhibited in the presence of polymerization catalysts. For instance, an addition of 10 g of hydroquinone to 100 kg of vinyl acetate which is to be distilled with steam, may be suited for this purpose.

WILLY O. HERRMANN.  
HANS DEUTSCH.  
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# ALIEN PROPERTY CUSTODIAN

## DEVICE FOR INDICATING CONTAMINATIONS IN THE OIL CIRCULATION SYSTEM

Walter Schrader, Dobritz, near Berlin, Germany; vested in the Alien Property Custodian

Application filed October 10, 1940

The invention relates to a device for indicating the contaminations as they are produced, e. g., by metal particles, carbon or the like, in the oil circulation system of internal combustion engines.

It is important for the operation of internal combustion engines, especially high stressed aircraft engines, that it is in time possible to ascertain and eliminate foreign bodies in the oil circulation system, particularly small metal particles. The presence of an increased quantity of metal particles in the oil circulation system during operation is further an indication that on the rubbing surfaces, e. g. in the bearings and on the piston, damages have occurred which after a short time would lead to the destruction of the internal combustion engine. It is therefore desirable to have a univocal indication of the presence of foreign bodies in the oil circulation system for being able to stop the internal combustion engine in time.

The invention proposes for the purpose of timely ascertaining contaminations in the oil circulation system of an internal combustion engine by ascertaining resp. determining the changes caused by these contaminations of the state of an electric control circuit. The connection may be arranged so that either variations of capacity or of the resistance, produced by contaminations, of the electric control circuit are indicated. For this purpose a measuring chamber, preferably designed after the manner of a filter with probe elements sensitive to the contaminations in the oil, is inserted in the oil circulation system, the operating conditions of said chamber being electrically controlled and made visible. The single probe elements can either be electrically jointed by shunt or series connection or insulated from each other. Preferably filter elements are used as probe elements, said filter elements being e. g. connected with a source of current, in the circuit of which furthermore a resistance and an indicating device, preferably a glow lamp can be connected in series. Instead of a glow lamp it is of course also possible to employ another electric indicating device. With an increasing accumulation of metal particles or carbon between the filter elements, variations of voltage and current are occurring which are made visible, in this case, by a glow lamp.

The details of the invention are to be seen from the examples of construction of the drawings, wherein

Fig. 1 is a measuring chamber with the filter

elements alternately connected with each other after the manner of a condenser;

Fig. 2 is a measuring chamber with the filter elements connected in series after the manner of a resistance;

Fig. 3 is a possible connection for a measuring chamber according to Fig. 2;

Fig. 4 is another connection for a measuring chamber according to Fig. 2;

Fig. 5-8 connections for a measuring chamber according to Fig. 1;

Fig. 9 a particular form of embodiment of a measuring chamber in conjunction with a centrifuge.

The measuring chamber represented in Fig. 1 has in its interior ribbon-shaped, lattice-like or disk-shaped filter elements 1 which are insulated from each another by distance pieces 2. The filter elements 1 are alternately connected with each other after the manner of a condenser. The terminal connections 3 and 4 are brought out of the casing. The measuring chamber is inserted in the oil circulation system (not represented) of an internal combustion engine. If foreign bodies are present in the oil stream flowing along the filter elements 1, or if the oil is varying so far that its electric resistance is considerably differing from the original resistance of the oil still in working condition, then, in the case of the two terminal connections 3 and 4 of the filter elements 1 being put in the circuit of a source of current, the occurring variations of current resp. voltage are releasing an indicating device.

In the case of the necessity of measuring the variations of the electric resistance between the filter elements, the usual connections of Figs. 3 and 4 may find application, which can be used both with continuous current as well as with alternating current. The terminals 3 and 4 of the filter elements 1 are, as shown in Fig. 3 put in the circuit of the source 5 of direct or alternating current, in which still a loading resistance 6 and a glow lamp 7 as indicating device are connected. If the resistance between the filter elements 1 has varied due to accumulations of metal particles, carbon or the like, the glow lamp 7 flashes up, provided a correct dimensioning of the resistance 6. The resistance 6 can be so tuned that under normal operating conditions the glow lamp either fully extinguishes or continues glimmering. If there is the necessity of a particularly high sensitivity, then the measuring chamber with the terminals 3 and 4 of the filter elements 1 can be put, according

to Fig. 4, in the bridge arm of a Wheatstone bridge, the indicating device being connected in the bridge arm. The source of current of the bridge can be for alternating current or direct current.

The same connections as in Figs. 3 and 4 can also be used for a measuring chamber, in which the filter elements are connected in series, according to Fig. 2. In this case the filter elements represent an electric resistance and are preferably made either of resistance material or have connected between every two filter elements a particular resistance 8. Any accumulation of foreign bodies, e. g. metal particles between the filter elements 1 in a measuring chamber according to Fig. 2 will set up a variation of the total resistance due to the contact between the single filter elements 1 and this variation of the resistance will result for the connections of Fig. 3 or 4 in any case in a corresponding variation of voltage or current.

If it is desired, instead of measuring the resistance according to Figs. 3 and 4, to measure the variations of capacity, then the connections according to Figs. 5-8 can be used, in which the measuring chamber has a construction corresponding by principle to that of Fig. 1. A direct short circuit between the filter elements 1 through the medium of the foreign bodies must, however, be avoided; but the foreign bodies accumulating between the filter elements are only permitted to vary the capacity of the condenser represented by the single filter elements.

In the case of measuring the current, a connection according to Fig. 5 can be used, in which case the choke coil 9 must be adapted to the condenser 10 consisting of the filter elements 1 and to the frequency of the source of current. The choke coil 9 and the capacity are connected in series. In the circuit still a loading resistance 11 known per se is provided. The oscillatory circuit comprising the choke coil 9 and the condenser 10 is preferably tuned to the half resonance curve. The variation of capacity of the condenser due to the accumulation of foreign bodies between the filter elements 1 will have the consequence of a simultaneous variation of the tuning of the oscillatory circuit, which is now tuned to another point of the resonance curve. This variation of the tuning of the oscillatory circuit is indicated by the indicating device 7 which in this case is an alternating current apparatus.

For the measurement of voltage the choke coil 9 and the condenser 10 of the oscillatory circuit are connected according to Fig. 6 in parallel. The resistance of this oscillatory circuit is, in the case of resonance, in a manner known, per se, practically an infinite one, whereas in the connection according to Fig. 5 the resistance of the oscillatory circuit is in the case of resonance practically zero. Also in the connection according to Fig. 6 a limiting resistance is provided.

If a particular sensitiveness is required in the case of measurement of capacity, there is a possibility of applying one of the known bridge methods, similar to the way of Fig. 4. The indicating device 7 in the bridge arm shows directly the variations of the capacitance of the condenser 10.

Instead of the bridge method still the usual microphone connection shown in Fig. 8 can be used. There is only the necessity to replace the microphone by the condenser 10 consisting of the filter elements 1. Between the condenser 10 and the resistance 12 the variations of voltage are either directly indicated or preferably amplified by an amplifier known per se, in which case there is also the possibility of using the variations of voltage for releasing a sound signal or the like.

The measuring chamber can be inserted directly into the oil circulation system or in a branched off part of oil circulation system. Further it is possible to previously centrifuge the total amount or a part of the oil in the oil circulation system and to conduct only the oil stream carrying a high percentage of foreign bodies to the measuring chamber resp. the filter elements in the measuring chamber.

Fig. 9 shows a measuring chamber, in the interior of which a shaft 13 is mounted, which on its turn carries in the vicinity of the oil inlet 15 into measuring chamber a rotor 14 operating as centrifuge. At the same time a cylindrical body 16 leaving in the casing 17 an annular cross-sectional passage area 18 is mounted on the shaft 13. The front part of the cylindrical body 16 can be shaped approximately streamlined and provided with bores 19, through which the oil cleaned by the rotor is passing. The cylindrical body 16 has in the example of construction a cylindrical extension 20 which is open in the direction of the oil outlet 21 of the measuring chamber. The outlet of the cylindrical extension 20 may discharge into an annular channel 22 connected with casing 17. The oil delivered by the rotor 14 through the bores 19 into the cylindrical extension 20 reaches in the direction of arrow directly the outlet 21 of the measuring chamber. The centrifuged oil carrying a high percentage of foreign bodies is delivered to the narrow annular passage formed between the walls of the cylindrical body, the cylindrical extension 20 and the casing 17 and thence pressed into the annular channel 22. In this annular channel 22 the foreign bodies are separated and for entering the adjacent sump 23.

If the cylindrical body 16 and the cylindrical extension 20 are rotating with the shaft 13, the latter must be insulated, for this reason, from the casing 17 at 24, and the cylindrical body with its cylindrical extension connected to a source of current by a slip ring arrangement 25. The casing 17 of the measuring chamber is likewise connected to the source of current, so that owing to the foreign bodies in the oil delivered by the rotor 14 to the narrow annular passage 18 either the resistance is varied or the capacity in case the cylindrical body is forming a condenser with the cylindrical extension 20 and the casing 17.

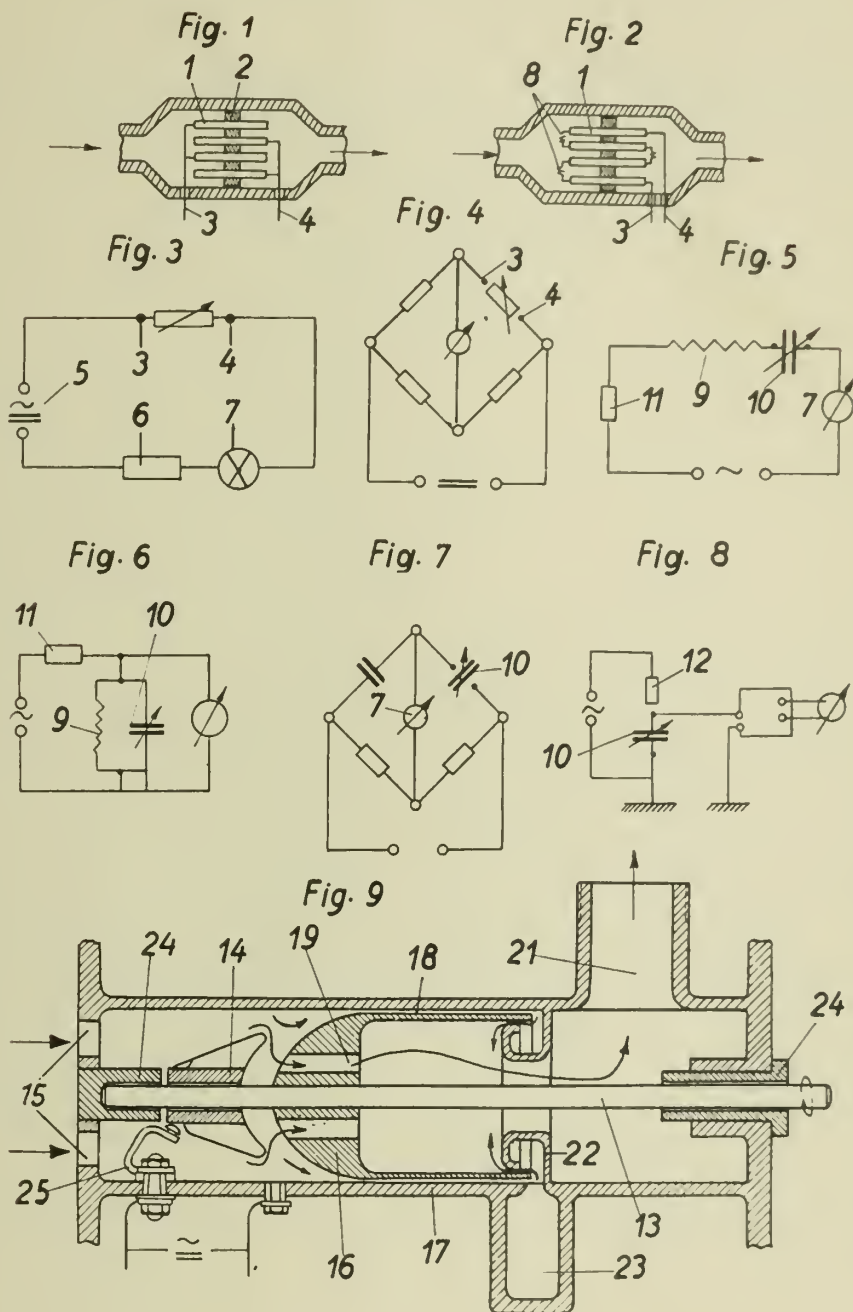
If it is not desired to lead the current in, through a slip ring arrangement 25, the measuring chamber can be so designed that the cylindrical body 16 and/or the cylindrical extension 20 are mounted independently of the shaft 13 in the casing 17 and connected to the source of current.

WALTER SCHRADER.

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DEVICE FOR INDICATING CONTAMINATIONS IN  
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360,689



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ALIEN PROPERTY CUSTODIAN

ARRANGEMENT ADAPTED TO SUPPRESS  
RADIO FREQUENCY CURRENTS ON CON-  
DUCTORS

Hans Otto Roosenstein, Berlin, Germany; vested  
in the Alien Property Custodian

Application filed October 17, 1940

This invention relates to means to suppress the flow of radio frequency currents on conductors, especially of the so-called "shell" waves on the outer surface of cable shielding. Contradistinct to prior practice, according to this invention, to the said end, the conductor which is to be rid of radio frequency waves is built up of portions of dissimilar characteristic impedance, preferably of  $\lambda/4$  length rather than by the aid of a short-circuit or rejector system, with the result that the radio frequency waves are gradually attenuated completely as a result of reflections produced at the points of discontinuity of the characteristic impedance. The general and broad principle underlying the invention shall now be explained in greater detail by reference to the appended drawing as applied to the feeding of an antenna S by way of a shielded line or cable L. If the outer shell of the line were simply free-ended, this outer surface, in the light of experience, would become excited; in other words, so-called shell waves would arise and these would exercise a harmful effect upon the antenna radiation. In order to avoid the said waves, the outer sheath is composed of several pieces or portions A<sub>1</sub>, B<sub>1</sub>, A<sub>2</sub>, B<sub>2</sub> of dissimilar wall thickness, and each of these possesses different characteristic impedance values. The length of these components is preferably equal to  $\lambda/4$ . Now, if the assumption is made that at the juncture of connection points of the cable K itself there still flows a vanishingly small current I, it can be demonstrated that the current at point

$$1 = \frac{Z_B}{Z_A}$$

and the current at point

$$2 = I \cdot \left( \frac{Z_B}{Z_A} \right)^2$$

while the current at point

$$3 = I \cdot \left( \frac{Z_B}{Z_A} \right)^3$$

where Z<sub>B</sub> and Z<sub>A</sub> the surge or characteristic impedances of the line portions A and B. For instance, if

$$\frac{Z_B}{Z_A} = 3$$

it follows that at point K flows a current equal to one-twenty-seventh that at point 3; in other words, the shell wave has dropped to  $1/27$ th. If, in line with what is being shown in the drawing, there is moreover used an antenna at the base of which only a small current intake is required, in other words, for instance, a  $\lambda/2$  antenna, it will be seen that also the shell wave amplitude at the base end of the antenna is extremely small. If the antenna currents at points c and a are as 10:1, it follows that the amplitude of the shell waves at point K is  $= 1/270$ th the amplitude at point B. These shell waves may be taken to be negligible for practical purposes.

The invention is not confined to the suppression of shell waves, in fact, it may generally be used for the purpose of suppressing radio frequency waves along conductors. If the length of the component parts is not made equal to  $\lambda/4$ , then the calculation is somewhat more complicated. However, the attenuation of shell waves also in this instance is practicable in the same way as above described.

HANS OTTO ROOSENSTEIN.



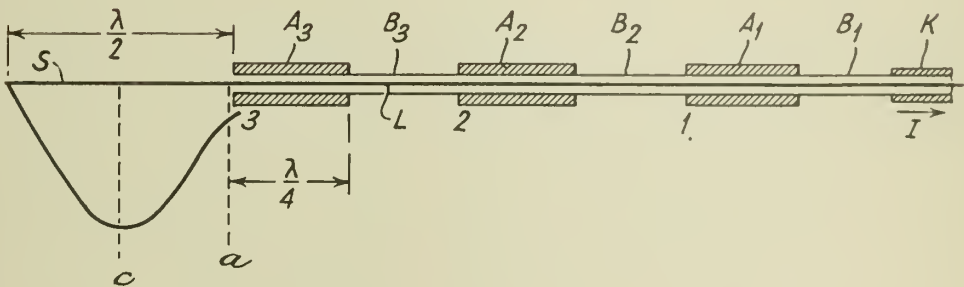
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H. O. ROSENSTEIN  
ARRANGEMENT ADAPTED TO SUPPRESS RADIO  
FREQUENCY CURRENTS ON CONDUCTORS  
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# ALIEN PROPERTY CUSTODIAN

## DEVICE FOR ADJUSTING THE PITCH OF AIR PROPELLERS

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the Alien Property Custodian

Application filed October 22, 1940

This invention relates to a propeller adjustment device.

Certain devices for the adjustment of the pitch of air propellers while in operation are known in which the blade adjustment is carried out by means of a bushing or sleeve mounted to slide on the propeller shaft. The sliding operation of said bushing or sleeve is effected by means of an adjusting lever or traverse which surrounds the bushing and at one end is mounted to swing on a stationary point of the aeroplane, the other end being connected by a simple link with an adjustable system of rods leading to the pilot's seat. The sliding motion received by the sliding bushing is transferred to the base of the propeller blades, which are turnably mounted, by means of jointed levers. Although this known device enjoys the advantage of great simplicity as compared with other designs of blade adjustment, it has not proven useful in actual practice. It was found that the suspension arrangement which allows the adjustment traverse surrounding the sliding bushing to swing around one axis only, or around two parallel axes, showed considerable wear and tear, especially at the sliding bushing, after only a few flying hours.

It is an important object of the present invention to provide means in the adjustment device for avoiding such premature wear. In the course of the investigations leading to the present invention it has been found that this defect of the known device is mostly due to the fact that the propeller shaft and the axis for the swing adjustment of the traverse while in operation deviate imperceptibly from their original position at right angles to each other. Such deviation is brought about by certain forces during the flight. The relatively rigid connection of the adjustment traverse on one side and the play of the parts belonging to the adjustment device on the other side tend to cause a sort of wobbling motion of the traverse ring, or of the sliding bushing, causing the latter to deteriorate rapidly, e. g., by corrosion, since the adjustment traverse owing to its rigid connection cannot give way to the oscillating movement. Moreover, the sliding motion of the adjustment sleeve causes an edgewise pressure stress which, in cooperation with the wobbling motion, tends to corrode or wear out the sliding bushing.

Therefore, the present invention has for its object to provide a construction of a propeller adjusting device which permits wobbling motion of the parts without any substantial corrosion. With these and further objects in view, as may

become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which:—

Fig. 1 shows a schematic, perspective view of the essential parts of an adjustment device having the invention applied thereto.

Fig. 2 is a side elevation, partly in section, of the same adjustment device.

Fig. 3 is a plan view, partly in section, on line A—B of Fig. 2.

Fig. 4 is a section according to line C—D of Fig. 2.

Fig. 5 is a section similar to Fig. 4, but showing another design of the gimbal mounting of the adjustment device.

Similar characters of reference denote similar parts in the different figures.

As here shown, I provide means between the stationary points for the suspension of the device and the sliding bushing or sleeve for permitting a cardan motion, i. e., relative swinging of the parts around two axes at right angles to each other. The traverse for adjusting the sliding bushing is suitably designed as a ring surrounding the bushing. Said ring at one end is mounted at a stationary point of the aeroplane, preferably by means of a link or swing member, so as to move around two perpendicular axes, while at its other end the adjustment spindle is connected, movable, also around two perpendicular axes, by means of the spindle nut. The annular traverse which surrounds the sliding bushing and the propeller shaft is connected with the sleeve effecting the blade adjustment by means of a ball bearing which preferably is in a position to receive axial forces. The traverse ring is swingably connected with the outer ring, or with the supporting ring for the ball bearing, by means of trunnions.

By inserting the component parts or elements, as above described, which make possible a gimbal movement of the adjustment sleeve, great improvement in the stress conditions of the adjustment device has been obtained and, as a consequence, the number of flying hours could be considerably increased. Preferably, and as here shown, I may obtain a further improvement of the stress conditions by manufacturing the ad-

justment sleeve and/or a sliding bushing mounted on the propeller shaft from synthetic material, especially synthetic resin with textile inserts or admixtures. This material may consist of various kinds of synthetic compressed material, more particularly insulating material from synthetic resin, especially on a phenol-aldehyde basis, such as the material which is known under the registered Trade Mark "Bakelite". Also hard textile fabrics, hard wood and hard paper of all sorts as well as any pressing material from paper and textiles in layers in non-laminated form may be used after having been treated with a suitable binding substance. The sliding bushing mounted on the propeller shaft can be made of the said synthetic material, whilst the sleeve moving on same can be made of metal. By manufacturing the bushing and/or sleeve from any of the synthetic materials mentioned, a longer life of the device is obtained than would be the case if it would be manufactured exclusively from metal or metal alloys. Even if metal alloys of the highest resistance are used in the manufacture of said bushing and sleeve, undesirable quick wear and tear have been found to be unavoidable. Applying the experience so far made with slide bearings of artificial material, it was a surprise to find out that by using synthetic material in the device, according to the invention, the dangerous stresses at the edges of the sleeve could be met.

Referring now to the drawings in greater detail, and first to Figs. 1 to 4, it will be seen that the propeller blades 1 and 2 of the two blade propellers are turnably mounted in the propeller hub 3. The hub 3 is coupled with the hub neck 4 by means of two mutually engaged toothed portions indicated at 5, both parts being held together by a threaded member 6 on the inside. The hub neck 4 at its other end is shaped to fit the different motor connections and is connected with the motor shaft by screw bolts 7. An anti-friction bushing or sleeve 8 consisting of synthetic resin on a phenol-aldehyde basis with textile admixtures is fastened on the hub neck 4 by means of screw bolts 9, for reception of an adjustment sleeve 10 mounted to slide on the bushing 8, and provided with eyelets 11 which have the guide members 12 jointed to them for connection with adjustment levers 13 which are rigidly screwed to the base of the propeller blades by means of their female thread so that any swinging of the levers 13 will also cause the propeller blades 1 and 2 to be turned correspondingly. The adjustment sleeve 10 is surrounded by the ring-shaped adjustment traverse 14 which at its extreme opposite ends I and II is connected by means of a cardan or universal joint to connecting members which in turn are suspended at stationary points of the aeroplane. The connection at II is adjustable in such a way that the traverse ring during the adjustment can be swung around the point I. The suspension of the traverse ring 14 at I, which although movable is not adjustable, is arranged by means of a guide member or connecting rod 15 which on one side is jointed at the stationary point 16 (Fig. 3) and on the other side rests with its fork-shaped end 17 in an automatic or self-adjusting ball bearing 19 (Fig. 4) by means of a trunnion 18. The term "automatic or self-adjusting ball bearings", as used in this specification, relates to ball bearing of the type having a spherical bearing surface for the outer race ring permitting swing motion of the ball bearing in any direction, so that it may automatically adjust itself to the direction of the axis

of rotation of the inner race ring. Said bearing 19 is mounted in the eye 20 of the traverse ring 14 so that the traverse ring can be turned around two perpendicular axes with respect to the guide member 15. The traverse ring 14 can be swung around the suspension at I by means of the adjustment spindle 21 connected at II, thus producing the adjusting motion. An automatic ball bearing 22 at the right-hand end, Fig. 3, of the spindle 21 permits rotation thereof as well as swinging through a certain angle, but prevents axial movement of the spindle which carries a nut 23 mounted to swing in all directions, with respect to the traverse ring 14, at II, by means of an automatic ball bearing 24. The nut 23 is prevented from turning by an arm 25 and a bolt 26. The nut 23 is also prevented from sliding with relation to the traverse ring 14 by means of the threaded rings 27 and 28, the first ring being screwed together with the traverse ring 14 and serving as a frame for the ball bearing 24, whilst the second ring is mounted on the other side of the ball bearing 24 and screwed together with the nut 23. The free end of the spindle 21 is provided with a safety-and stop ring 29. Displaced by 90° in relation to the suspension points I and II, the traverse ring 14 carries trunnions 30 and 31 (Fig. 4), between which rests the supporting ring 32 for the ball bearing 33. The inner ring 34 of the bearing 33 is mounted on the adjustment sleeve 10, being forced against the stop 36 of the said adjustment ring 10 by means of a threaded ring 35. Another threaded ring 37 which is screwed into the supporting ring 32 helps to hold the outer ring of the ball bearing within the supporting ring. A key 38 engaging in a suitably dimensioned slot of the sliding bushing 8 prevents the adjustment sleeve 10 from turning with relation to the bushing 8.

Instead of the cardan-like connection by provision of automatic ball bearings between the traverse ring 14 and the guide member 15 as well as the spindle 21, the traverse ring can also be connected cardan-like or gimbal-fashion with the adjustment sleeve or with the supporting ring 32 of the ball bearing 33 by means of an auxiliary ring 32' (Fig. 5). This ring 32' can be swung around the trunnions 30 and 31, whilst the supporting ring 32 can be swung perpendicularly thereto around the trunnions 30' and 31' of the ring 32'.

The operation of the device is essentially as follows: When in operation the propeller revolves around the propeller or motor axis A—B jointly with the hub-neck, the anti-friction bushing 8 mounted thereon, the adjustment sleeve 10 and the inner ring 34 of the ball bearing 33, with relation to the outer ring of the ball bearing and the remaining parts of the adjustment traverse. The position or pitch of the propeller blades thus revolved is dependent upon the axial position of the adjustment sleeve 10, and consequently upon the position of the nut 23 on spindle 21 which can be turned in the automatic ball bearing 32 by means of a cardan drive 40, as indicated by the broken line on Fig. 3. Rotation of the spindle 21 causes the nut 23 to be moved axially and, since the latter is fixed immovably in the traverse ring 14, it is bound to take along the traverse ring swinging same around the pinion 18 of the suspension point I. Through this swing movement the adjustment sleeve 10 is moved on the bushing 8 by means of the ball bearing 33 adapted to carry an axial load. This movement is transferred by way of the guide members 12 to the adjusting

levers 13 which in turn take along the propeller blades, that means, cause them to turn in their bearings.

Owing to the cardan-like or gimbal mounting of the traverse ring by means of automatic ball bearings, all parts of the adjustment device can follow up any possible "skewing" which might emanate from the forces taking effect during the flight, so that premature wear and tear of the adjustment sleeve 10 or the bushing 8, as by corrosion, will be largely avoided. By manufacturing the sliding bushing 8 from synthetic material, like hard fabric, it will be possible to preclude any corrosive effects even in continuous operation. It is contemplated within the purview of this invention that the antifriction bushing 8 as well as the adjustment sleeve 10 or either of said parts may be made from hard fabric or any similar material.

The adjustment of the propeller blades is accomplished, as described above, by turning the threaded spindle 21 by means of the indicated cardan drive member 40, which can be done manually, mechanically or electrically. In place of an electric drive with rotating screw spindle a hydraulic drive can also be employed.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

ROBERT PRAUSE.



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3 Sheets-Sheet 1

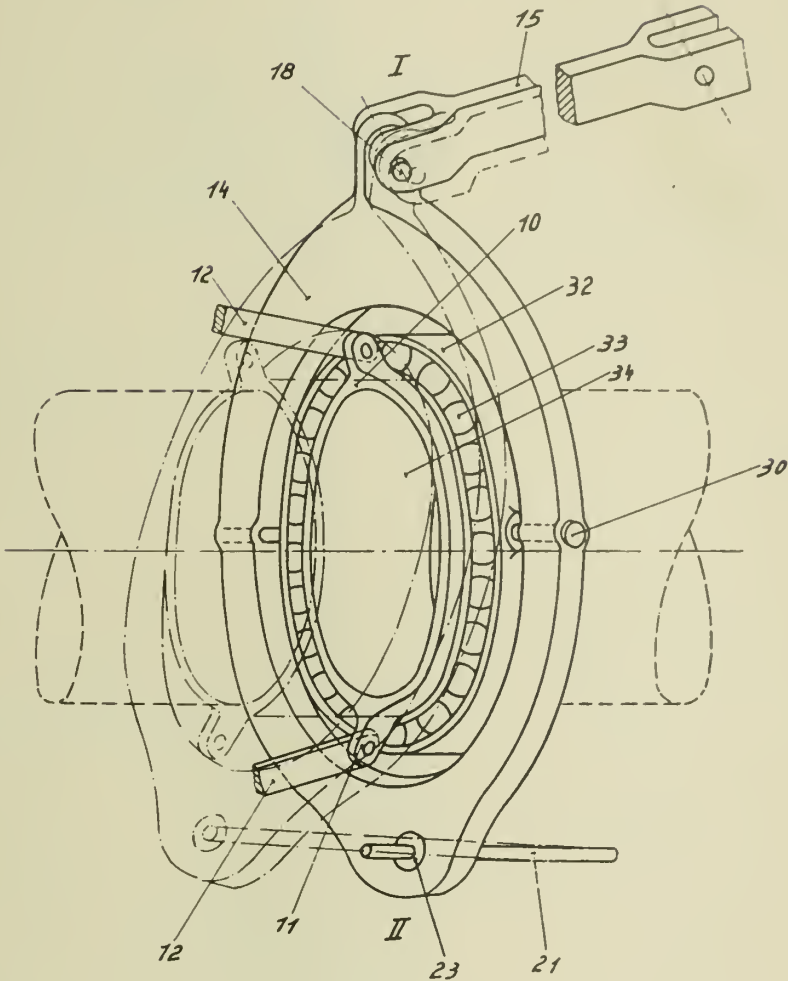


Fig. 1

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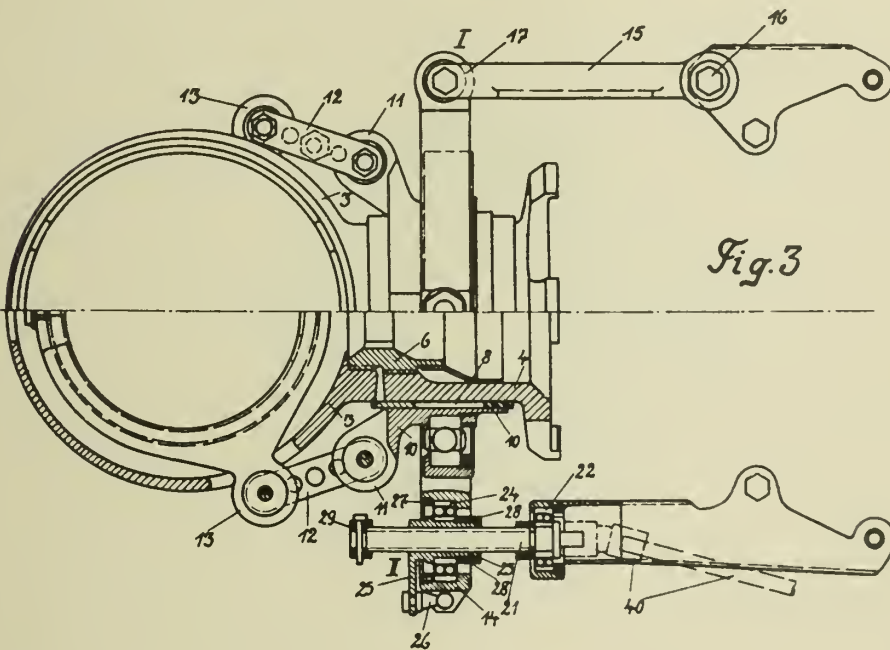
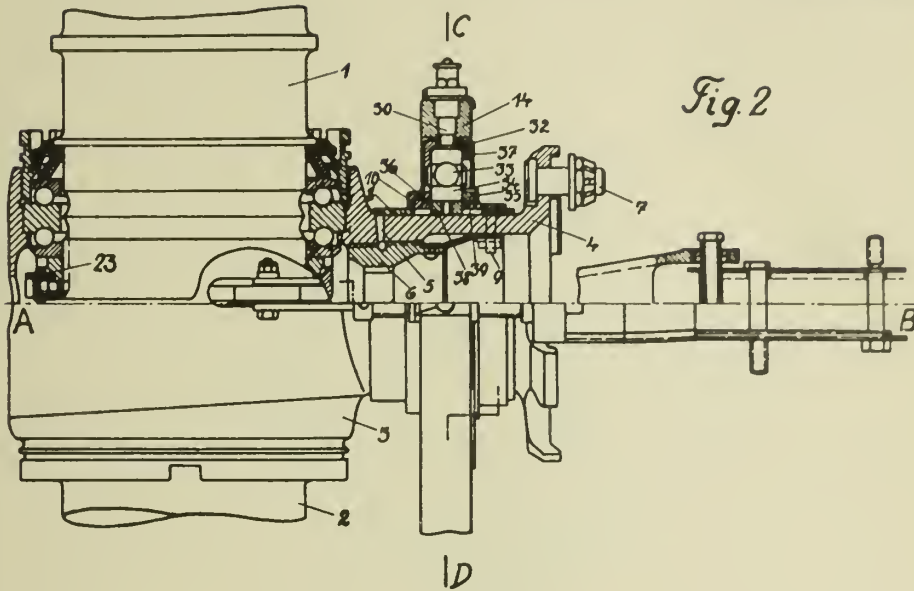
BY A. P. C.

R. PRAUSE  
DEVICE FOR ADJUSTING THE PITCH  
OF AIR PROPELLERS  
Filed Oct. 22, 1940

Serial No.

362,279

3 Sheets-Sheet 2



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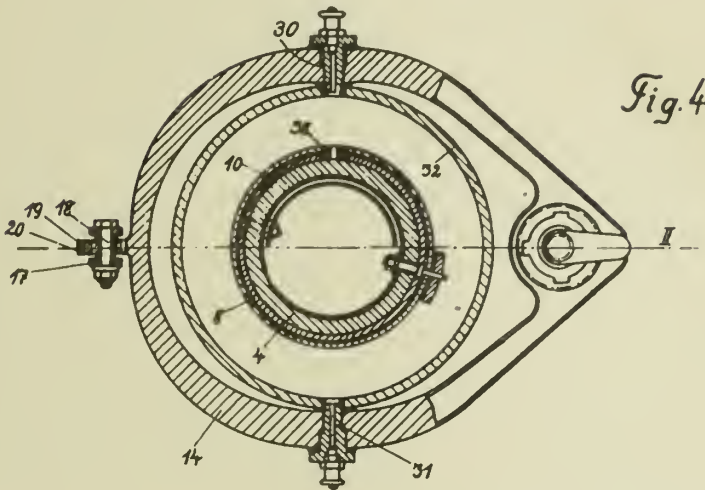


Fig. 4

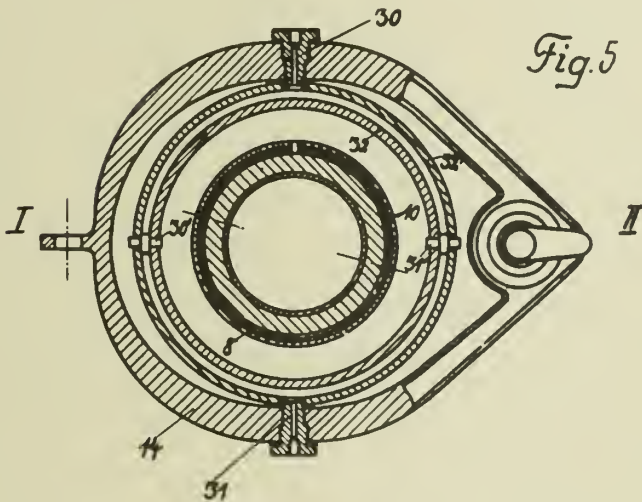


Fig. 5

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# ALIEN PROPERTY CUSTODIAN

## AIR PROPELLER DRIVING SYSTEM

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Application filed October 22, 1940

This invention relates to an air propeller driving system of the type in which the pitch of the air propellers is variable, and has particular reference to the driving means for adjustment of the propeller blades.

As is well known, the propellers of aircrafts are operating under conditions varying within a wide range depending on the flying conditions, such as, normal flight, gliding flight or dive braking with counter-gas (retardation of the speed of the diving aircraft by adjustment of the driving propeller blades to a "counter-pitch").

It is an important object of the present invention to provide means which permit adaptation of the adjusting device to said varying conditions.

With this and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which:

Fig. 1 is a schematical view of a propeller adjusting device having the invention applied thereto.

Fig. 2 is a diagram showing the complete plant including the control members.

Fig. 3 is a plan view, partly in a substantially horizontal cross section, of an adjusting device in which the sleeve setting lever is connected by a cardan arrangement with the members linked to its ends.

Fig. 4 is a side elevation, partly in a vertical section, of the device of Fig. 3.

Fig. 5 is a cross section of the device of Fig. 3.

Fig. 6 is a cross section similar to Fig. 5, the sleeve setting lever being connected to the sleeve by a cardan arrangement.

Similar characters of reference denote similar parts in the different figures.

As here shown, we provide two separately acting driving means for adjustment of the propeller pitch, one of said means being suitable for normal flight and having a low degree of insensibility, for cooperation with an automatic speed regulator, and relatively low adjusting speed, while the other is intended for conditions different from the normal flight, this latter regulator being manually controlled and being mainly

characterized by an adjusting speed which is a multiple of that of the first mentioned drive.

The term "degree of insensibility," as used in this specification, relates to the characteristic of a regulator which is expressed by the coefficient of the friction of the device divided by the adjusting force of the regulator, i. e.:

$$\text{Degree of insensibility} = \frac{\text{friction of the regulator means}}{\text{adjusting force}}$$

The figure should be less than 1 percent, and advantageously of the order of 0.15 percent or even less.

As here shown, both of the drives may include electric motors, one of which is fitted with a reduction gear of higher ratio; or the slow drive may include hydraulic means.

Preferably, and as here shown, the two driving means are arranged to act upon the opposite ends of a two-armed lever which surrounds a slidable adjusting sleeve and actuates the same, for turning the propeller blades connected thereto.

By reason of this particular double driving system, and more particularly by the rapid drive the adjusting device is exposed to high stress. Therefore, in order to avoid premature wear and tear, one or more elements permitting a cardan-motion are provided between the stationary points of the device and the slidable sleeve, thus avoiding jamming action in the system. It has been found that with a suspension of the adjusting device permitting swinging of the two-armed adjusting lever in one plane only, considerable damages may occur on the slidable sleeve, even after a few hours of flight, while these damages can be avoided by the said cardan suspension or gimbal mounting.

As here shown, the gimbal mounting may be effected by connecting the two-armed adjusting lever by automatic or self-adjusting ball bearings or by cardan joints, with the driving means engaging its opposite ends. The term "automatic or self-adjusting ball bearings," as used in this specification, relates to ball bearings of the type having a spherical bearing surface in the outer race ring permitting swing motion of the ball bearing in any direction, so that it may automatically adjust itself to the direction of the axis of rotation of the inner race ring. By way of alternative, a cardan joint or gimbal mounting may be provided between the two-armed lever and the sleeve.

According to a further feature of the invention, the slidable sleeve may consist of, or pro-

vided with, an antifriction bushing of artificial material, more particularly, artificial resin material with textile admixtures. Suitable materials are, e. g., artificial resins on the phenol-aldehyde basis, for instance, the material known under the registered trade mark "Bakelite." Hard texture, hard wood and hard paper as well as materials obtained by compression of laminated or non-laminated paper and textile material with suitable binders may also be used.

Referring now to the drawings in greater detail, and first to Fig. 1, it will be noted that the propeller blades 1 and 2 are mounted to be turnable in ball bearings 101 seated in the hub 3 of the propeller. Interiorly threaded setting levers 41 are fixedly screwed on the bases of the propeller blades and connected through connecting rods 42 to a sleeve 43 constituting the inner ring of a ball bearing whose outer ring 44 is connected to a surrounding two-armed adjusting or setting lever 46, by means of trunnions 45. The upper arm of said setting lever 46 is engaged by the piston rod 47 of a cylinder 48 which is mounted on the motor or gear casing 102 of the airplane and operated by oil under pressure. Also mounted on this casing is an electric motor 50 which by means of any suitable transmission gear operates on the lower arm of the lever 46. In the embodiment illustrated in Fig. 1, the motor shaft 51 itself is constructed as a threaded spindle engaged by a nut member 52 which is operatively connected to the lever 46, whereby the adjusting force is transmitted in a very simple manner.

The supply of oil to the pipes 103 and 104 of the cylinder 48 is under the control of an automatic speed regulating device (not shown) while with the speed regulating device cut off the connecting point of the piston rod 47 with the lever 46 forms a stationary pivot for swing motion of the lever 46 under action of the motor 50.

On the other hand, as the hydraulic mechanism 47, 48 is operating, the electromotive drive 50, 51, 52 is motionless and the link between the lever 46 and the end of the nut 52 acts as a pivot for the lever 46, since the nut 52 is self-locking on the spindle 51. It follows that on operation of the piston in the cylinder 48 the lever 46 is swung about this lower pivot, taking along the sleeve 44.

During control of the propeller blades by the electric motor 50 the same is switched off as the position of the propeller blades desired at the time has been reached. This is achieved by co-operation of the spindle nut 52 with contacts 53 in such a manner that the spindle nut 52 on engagement with one of said contacts closes or opens an electric circuit (not shown), respectively. A separate selection switch (not shown) serves to determine the operative contact 53. By way of alternative, a single contact or end switch may be adjustable along the spindle 51 by means of said selection switch which may be operatively connected to the hydraulic regulator by mechanical or electrical transmitting means.

Fig. 2 illustrates the general arrangement of the control means for the operation of the adjustable propeller. In this case, electric motors have been provided for both of the drives, i. e., an automatically controlled, slowly acting drive and a manually operated quickly acting drive. The blades 1 and 2 of the adjustable propeller are turned by swinging the lever 46, as in Fig. 1. The upper end of this lever is acted upon by an electric motor 60, through a speed reducing gear 61, mak-

ing up the slow drive. A centrifugal regulator 58 controls the speed of the motor 60, through a relay 59. To this end, the centrifugal regulator 58 is adjusted to maintain a predetermined propeller speed, which advantageously depends on the position of the gas control lever. As the actual propeller speed falls below this speed or exceeds the same, the centrifugal regulator will readjust the propeller blades accordingly. For instance, if the propeller speed becomes less than the predetermined speed, the regulator 58 through the relay 59 will operate the motor 60 in such a direction that the pitch of the propeller blades is decreased, whereby the driving motor is relieved and the speed may go up again. On the other hand, if the actual propeller speed exceeds the predetermined figure, the regulator will cause an oppositely directed blade adjustment, i. e., an increase of the propeller pitch and increased load for the driving engine of the airplane, whereby the speed is slowed down.

A switch 62 permits selective operation of the automatic or manual adjusting system by engagement of its lever 63 with the contact 64, switching in the automatic system, or the contact 65, switching off the automatic system and switching in the manual adjusting device.

If the manual system has been selected by engagement of lever 63 with contact 65, the said system may be operated by a push button switch 66, which in most instances will be combined with, or mounted on, the accelerator and actuates a quick adjustment motor 68, through a relay 67, whereby the propeller blades may be turned into a position for gliding.

The gas lever or accelerator which is indicated at 70, may be set to various positions. V is the open throttle position for normal operation; L is the idle running or no load position. If the lever is swung from the position V beyond position L, the propeller by means of a controller cylinder or drum type switch connected to the lever 70 is automatically set to a braking position which is independent from the position of the lever 63 of switch 62. Suitable means in the form of a link, brake or the like are provided to mark the no load position for the pilot.

The source of current for the propeller adjusting plant is indicated at 69 in the form of a storage battery. The lines indicated between the various parts of the plant indicate the electric conductors combined in the form of cables.

The design of the adjusting device, and especially the gimbal mounting thereof, is shown in Figs. 3 to 6.

Referring first to Fig. 4, the propeller blades are mounted to turn in the propeller hub 3, as in the above mentioned constructions, the hub 3 being coupled with the hub neck 4 by toothed end faces 5. An interior threaded member 6 serves for connecting the two parts. On the rear side, the neck member 4 may be constructed corresponding to the shape of the coupling on the motor shaft and it may be connected to the motor shaft by means of screws 7. A bushing 8 consisting of artificial material and more particularly of an artificial resin material of the phenol-aldehyde type including textile admixtures is mounted on the neck member 4 by means of screws 9. Slidably seated on the bushing 8 is a sleeve 10 having lugs or eyelets 11, Fig. 3, to which connecting rods 12 are jointed which on their opposite ends are jointed to the adjusting levers 13 of the propeller blades. Said levers 13 by means of their female thread are fixedly

screwed to the base of their propeller blades, so that the propeller blades 1 and 2 can be turned by swinging the levers 13. The ring-shaped setting lever or traverse 14 engages around the sleeve 10 and is jointed cardan-fashion, at two opposite points I and II, to members 15 and 21, Fig. 3, establishing the connection with the respective driving mechanisms, 54 and 57.

The ring 14 has trunnions 30 and 31, Fig. 5, on which is pivoted an interior holder ring 32 for a ball bearing 33, whose inner race ring 34 is seated on the sleeve 10, being forced against the stop face or collar 36 of the sleeve 10 by means of a threaded ring 35. A further threaded ring 37 which is screwed into the holder ring 32 serves for securing the outer race ring of the ball bearing in the holder ring. The slidable sleeve 10 is secured against turning on the bushing 8 by means of a key 38 engaging into a slot 39 of the bushing 8 the length of which corresponds to the maximum stroke of the slide motion.

The upper end of the two-armed lever or ring 14 is linked to the piston rod of the cylinder 54 by means of a connecting rod 15, Fig. 3, and a trunnion 18 which is supported in an automatic or self-adjusting ball bearing 19 of the lug 20 on the traverse ring 14, Fig. 5. It follows that the traverse ring 14 owing to the provision of the automatic ball bearing 19 is swingable with respect to the connecting rod 15 around two axes at right angles to each other.

Referring now to the opposite side of the traverse ring 14, Fig. 3, the electromotor 57 through a reduction gear 56 drives a threaded spindle 21 which is supported in an automatic or self-adjusting ball bearing indicated at 22, so as to be swingable while being secured against axial sliding. A nut member 23 on the spindle 21 is supported in the traverse ring 14 by means for an automatic ball bearing 24 fixedly secured in the traverse ring by a threaded ring 27 and permitting free swing motion of the nut to all sides but preventing slide motion thereof. A threaded ring 28 is fixedly threaded on the nut 23 and serves to prevent the nut from sliding with respect to the traverse ring. A locking and stopping ring 29 is provided on the free end of the spindle 21. The suspension points I and II are displaced by 90° with respect to the trunnions 30 and 31, Fig. 5.

The adjusting system operates as follows: The

piston in the cylinder 54, Fig. 3, is moved by feeding or discharging oil under pressure through the pipes 55, under control of an automatic speed governor. During operation of the piston in the cylinder 54 the electromotor 57 is switched off. The spindle 21 therefore stands still and its nut 23 owing to its self-locking action is stationary with respect to the aircraft. The traverse ring 14 therefore may swing about the pivot II and take along the slidable sleeve 10 through the ball bearing 32, 33, 34.

As the plant is switched over to control by the electric motor 57, the traverse ring 14 becomes swingable about the pivot formed by the pin 18, which is supported in the automatic ball bearing 19 and held in position by the connecting rod 15, which is locked by the liquid in the cylinder 54. The result of this swing motion of the traverse is the same as that of a swing motion caused by operation of the hydraulic drive, except that the adjustment is effected at a considerably higher speed. If a kind of wobbling motion of the traverse 14 or of the slidable sleeve 10 is caused owing to the forces acting during the flight, the traverse member or the sleeve owing to the provision of the automatic ball bearings 19 and 24 may freely yield to such forces so that jamming and consequent high wear are avoided.

Any possible edgewise pressing which might still occur is held within admissible limits by provision of the bushing 8 of artificial resin.

A modified arrangement for permitting cardan-motion of the parts is illustrated in Fig. 6. In this arrangement, the traverse ring 14 is connected cardan-fashion with the slidable sleeve 10 or with the holder ring 32 of the ball bearing 33 on this sleeve by means of a further ring 32' which is swingable about the trunnions 30 and 31, while the holder ring 32 in turn is swingable perpendicularly thereto about the trunnions 30' and 31' of the ring 32'.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

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AIR PROPELLER DRIVING SYSTEM

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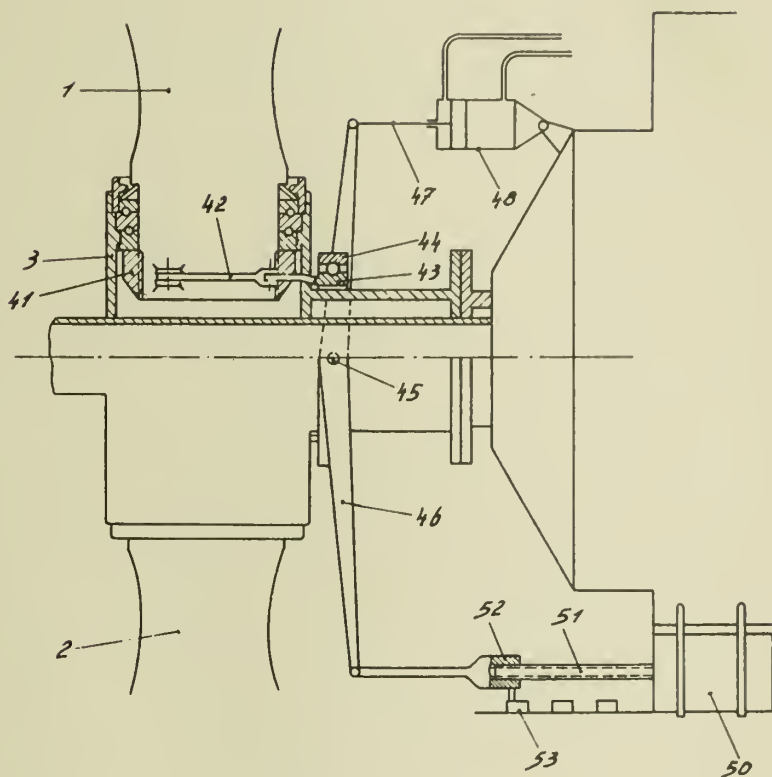


Fig. 1

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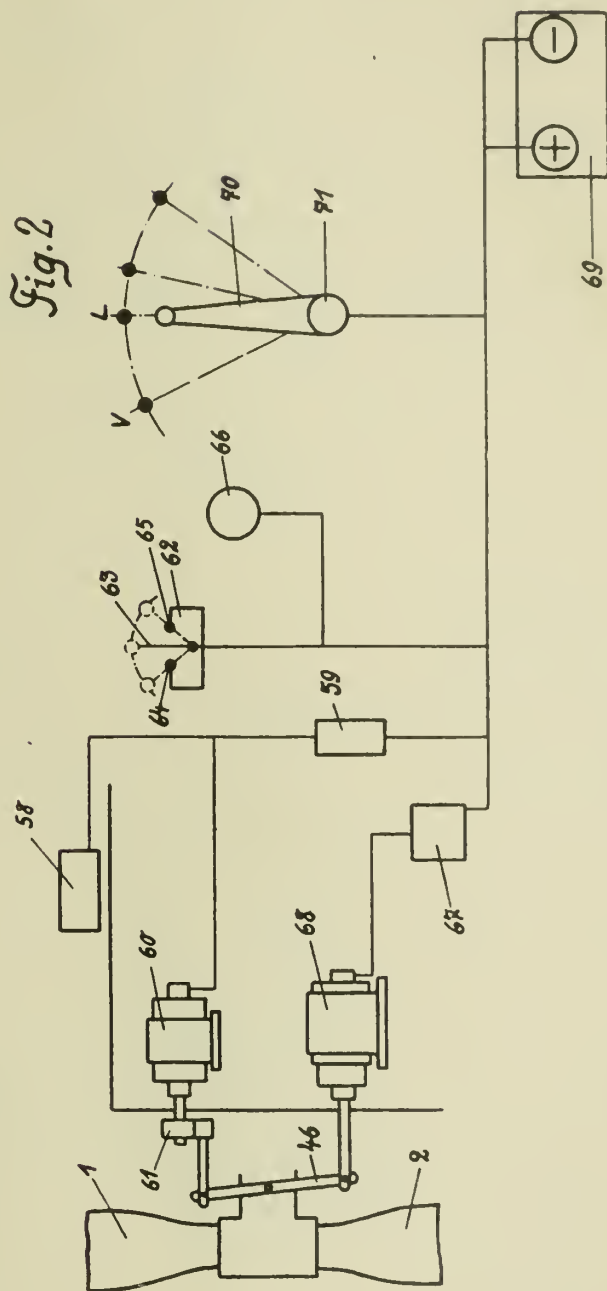
# AIR PROPELLER DRIVING SYSTEM

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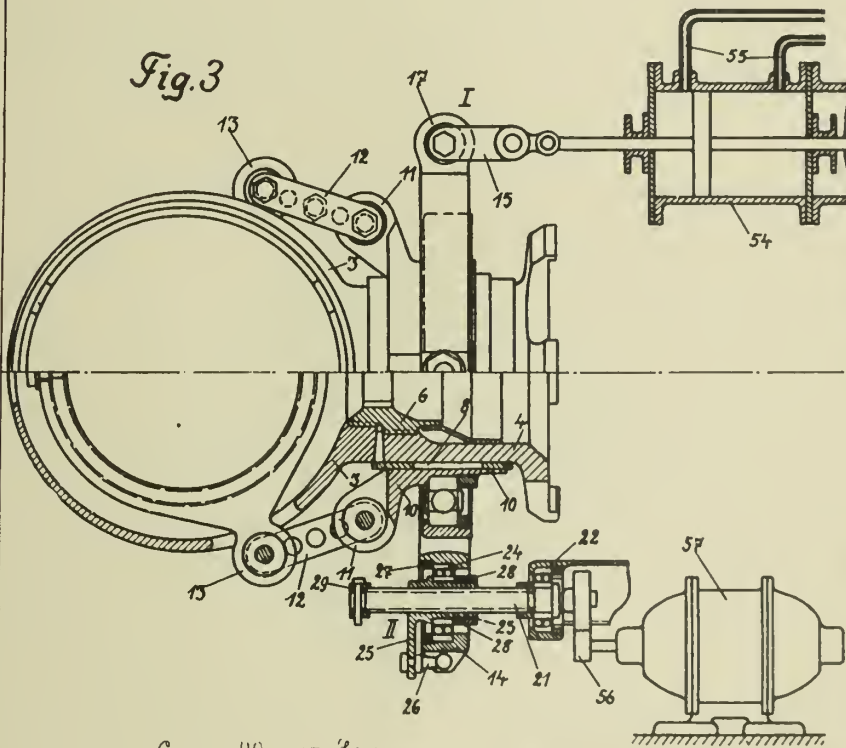
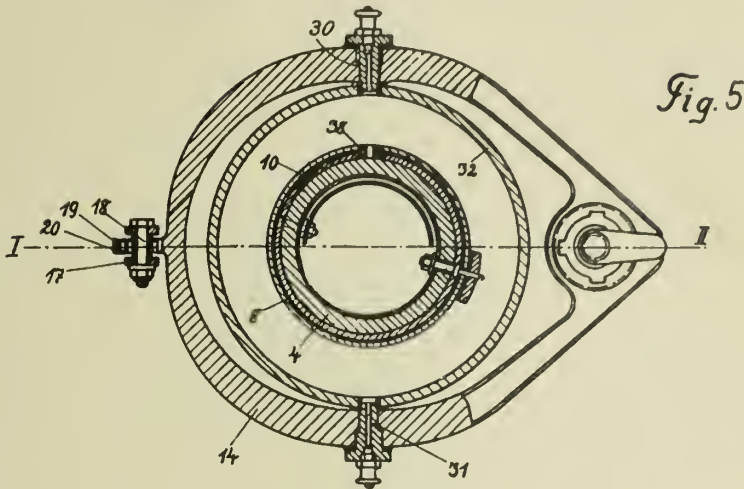
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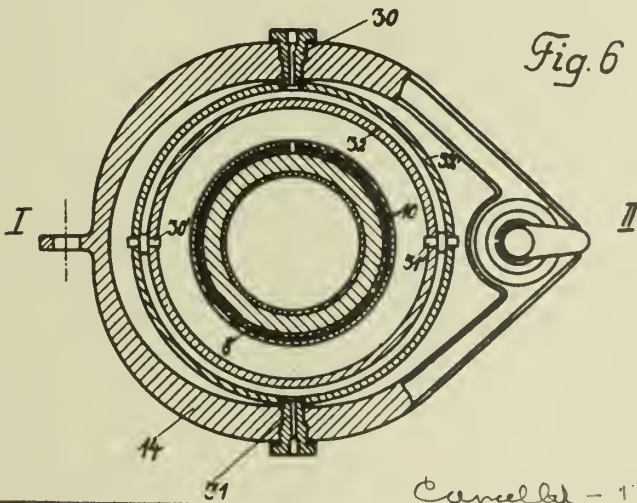
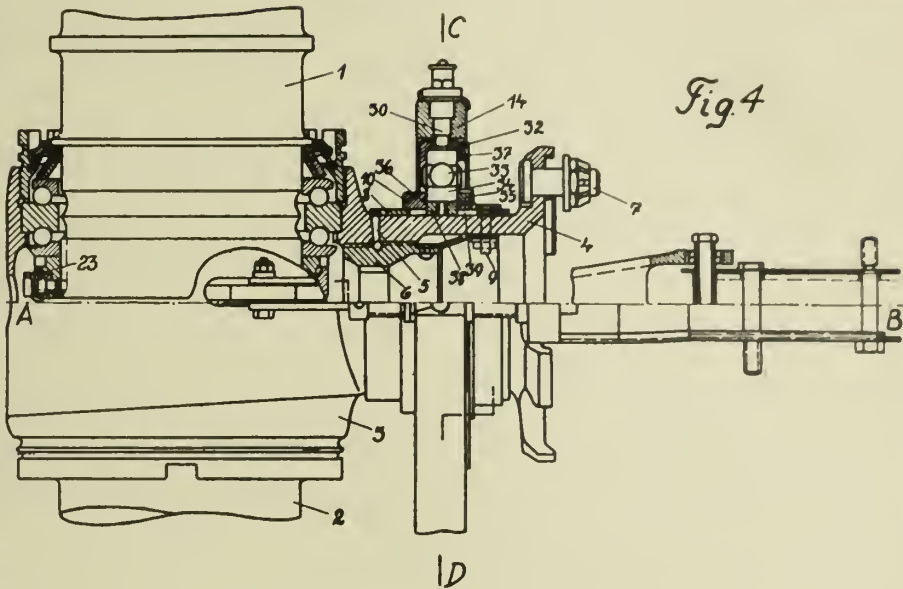
AIR PROPELLER DRIVING SYSTEM

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4 Sheets-Sheet 4



Cancelled - 1942

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# ALIEN PROPERTY CUSTODIAN

## TELAUTOGRAPH

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Application filed October 23, 1940

The present invention relates to an electric telautograph, by means of which, for instance, a drawing made by hand at a transmitting station is rendered visible substantially at the same time at the receiving station. In this case the remote transmission may be effected either by the wireless method or over lines. The present invention is particularly suitable in reproducing at the same time in the receiving apparatus the text written at the transmitting apparatus.

A known method for facsimile transmission of images with the aid of a cathode ray tube consists in scanning line by line the drawing or the text (television). It is true that in this case the advantage is presented that the images or text may practically be reproduced when transmitting the same. However, this method has the drawback that a very wide frequency band determined by the number of image points per unit of area is necessary for the remote transmission. To avoid this drawback the electron ray is guided according to another known method by suitable deflecting devices in the same manner as the stylus of the transmitter. The text written is reproduced on a photographic plate (telautograph). Although the advantage of a narrow frequency band is thereby obtained, the last-mentioned method presents nevertheless the drawback in that the drawing to be transmitted is only visible when developed by the photographic method.

According to the known telewriting method the coordinates are either represented by resistances and potentiometers which are mechanically controlled by the stylus or the change in resistance between the stylus and the fixed points is utilized on the writing plate consisting of resistance material to characterize the coordinates. The first method has the disadvantage that the stylus is prevented from being moved by the mechanical parts cooperating therewith, whereas the second method encounters difficulties as to the linearity of the transmission and as to the fact that resistance values cannot be directly transmitted over great distances.

The present invention combines the advantages of the abovementioned methods and avoids the disadvantages thereof. This may be accomplished by the fact that the electron ray of a cathode ray tube for reproducing pictures is controlled in accordance with the movements of the stylus of the transmitter and that each image point is visible on the fluorescent screen during the time necessary for writing the text, i. e., for instance, for 15 seconds to 2 minutes.

The arrangement according to the invention may preferably be designed in the manner that an extinction or ignition of the electron ray corresponds to a removal of the stylus from the writing plate or to a placing of the same thereon.

The electron ray cooperates with the stylus in such a manner that the position of the stylus on the writing plate is characterized by two potentials which are a measure for the coordinates of the point where the stylus is placed on the plate. These two coordinate potentials are represented by alternating voltages of different frequency. They serve to deflect the ray in both coordinate directions. In this manner a position of the luminous point on the fluorescent screen corresponds to the position of the stylus on the writing plate. The frequency band necessary for the transmission is not determined by subdividing the image but only by the speed with which the text is written and is accordingly very narrow (about 5 to 10 cycles/sec. as compared to more than  $10^6$  cycles/sec. as is the case with known telewriting methods).

Further details of the invention will be apparent from the description taken in connection with the accompanying drawings, in which

Fig. 1 shows the construction of the transmitting apparatus.

Fig. 2 shows a modified construction of the transmitting apparatus.

Fig. 3 shows the receiving apparatus in diagrammatic form.

Fig. 4 shows a schematical representation of the arrangement with two transmitting and two receiving apparatus.

According to the invention two homogeneous fluxes crossing each other and having the frequencies  $f_1$  and  $f_2$  are produced according to the invention on a conducting or semi-conducting writing plate. Each point may then be characterized by two potentials with these frequencies. Rectangular coordinate systems or also a curvilinear coordinate system may be employed. In the case of rectangular coordinate systems  $x$  and  $y$ , the amplitudes of the two alternating voltages which are tapped off by the stylus when placing it on the writing plate are linearly dependent upon  $x$  and  $y$ , i. e.,

$$U_1 = a_0 + a_1 x \text{ with the frequency } f_1$$

$$U_2 = b_0 + b_1 y \text{ with the frequency } f_2$$

These alternating voltages vary when writing the text in accordance with time with varying  $x$  and  $y$ . They are supplied to the transmission system, for instance, to a telephone line or to a radio channel.

The linearity between the voltages  $U_1$  and  $U_2$  and the coordinates  $x$  and  $y$  expressed by the two equations presupposes that the flow of current in the writing plate be homogeneous. This is accomplished according to the invention by designing the current leads in the form of extensions of the writing plate so that in the case of rectangular coordinates the cross-shaped type shown in Fig. 1 is obtained. The arms A serve to

connect the poles of the alternating-current sources through the highly conducting bridging members; B is the writing plate proper. If the arms A were short the two fluxes would become very distorted by the adjacent bridging members C, since these bridging members would absorb a great portion of the lines of flow of current as a result of their high conductivity. This disturbing effect disappears the sooner the longer the arms are made; but even in the case of very long arms A there would remain a residual distortion, since the lines of flow of current of the field enter the arms of the other field. The lines of flow of current running in the direction as indicated by the arrows enter, for instance, the horizontal arms as indicated by the dash lines shown in Fig. 1. According to the invention the arms serving as current leads are besides slotted in the longitudinal direction so as to increase the reactance of the arms to a considerable extent and the lines of flow of current are prevented from entering the horizontal arms (cf. Fig. 2). Even in the case of comparatively short arms, i. e., in the case of a relatively compact arrangement, the longitudinal slots bring about an approximately homogeneous flux.

In the arrangement shown in Fig. 1, the two energy sources are connected as indicated at P with one another and with the writing plate as well as with one pole of the transmission system T. The electrically conducting stylus D is connected to the other pole of the transmission system. In this manner there results at the input of the transmission system two alternating currents of different frequency which characterize the point where the stylus is to be placed on the writing plate, after the stylus has been brought into engagement with any point of the writing plate. However, the common point P establishes also a connection between the two adjacent bridging members C which in turn lead to a distortion of the two fluxes. Thus, for instance, the lines of flow of current running in the downward direction partly enter the right horizontal arm. This distortion may be eliminated according to the invention by giving both fluxes a common potential point as will be apparent from Fig. 2. Here the centers of the two secondary windings of the energy source repeaters are connected with each other as indicated at P, at which point the potential coincides with the potential at the center of the writing surface. In this manner a mutual influence of the two fluxes is avoided. The voltages at the points of the writing surface which lie symmetrically to the center differ, however, from one another only as regards to the phase and not to the amplitude. In order that the above-mentioned equations hold good it is necessary to add through the repeaters  $\ddot{U}_1$  and  $\ddot{U}_2$  a predetermined amount of the two voltages to the tapping voltages.

Another possibility of avoiding a disturbing influence of the fluxes consists in employing a point of the writing surface, for instance, a corner point or a center point as a common point for connecting the transmission system.

The fact that the voltage applied to the transmission system disappears when removing the stylus from the writing plate may be utilized to extinguish and ignite the luminous point in the

receiving tube. However, according to the invention an energy source having the frequency  $f_3$  may be connected as shown in Fig. 2 in series with the stylus so that the disappearance and the appearance of the current of this frequency may bring about an extinction and ignition respectively.

When the stylus is brought into engagement with the writing plate the distribution of potential of the fluxes must not be disturbed. The conditions of resistance must therefore be chosen accordingly. Under circumstances it may be preferable to insert a sufficiently high resistance in series with the stylus.

In Fig. 3 is shown the construction of the receiving apparatus. The operation thereof is as follows: The oscillations having a frequency  $f_1$ ,  $f_2$  and  $f_3$  are separated from one another by the three filters F1, F2, and F3 and rectified in G1, G2 and G3. The two voltages obtained by rectifying the alternating voltages of the frequency  $f_1$  and  $f_2$  are supplied to the deflecting systems P1 and P2 of a cathode-ray tube. The voltage obtained by rectifying the alternating voltage of the frequency  $f_3$  serves to control the intensity of the electron ray of the cathode-ray tube, for instance, through the Wehnelt-cylinder W. Instead of the electric control of the electron rays also a magnetic control may naturally be employed in a known manner.

A complete transmission system according to the invention is shown in Fig. 4 in diagrammatic form. To each end of the transmission system T is connected a transmitting apparatus S as well as a receiving apparatus E so that the operator is always able to observe in his own receiving apparatus the text written by him. In this case he may also ascertain to what extent the lines which have already been drawn disappear again in order to redraw them if necessary.

When using the same frequency for the three directions it is also possible for the other operator to complete the drawing. To facilitate the completion of the drawing and the reproduction of the same the writing plate may be brought according to the invention to coincide with the luminous image. This coincidence may, for instance, be effected by the optical method. This may be accomplished in a simple manner by projecting the fluorescent screen on the writing plate. Another possibility of coinciding the reproduction with the drawing consists in designing the writing plate in the form of a plate permeable to light so that it may be placed on the fluorescent screen. In this case the writing plate may be made, for instance, in the form of a wire gauze or in the form of a metal layer permeable to light and applied to a glass plate preferably by the spraying method. The control means and amplifier lying in the circuits are then preferably so adjusted that the reproduction coincides with the drawing so that when bringing the stylus into engagement with the writing plate the luminous point is directly visible thereunder. With the aid of gain adjusting devices in both circuits F1 G1 and F2 G2 of the receiving apparatus the coincidence of the reproduction with the drawing may easily be adjusted.

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Fig. 1.

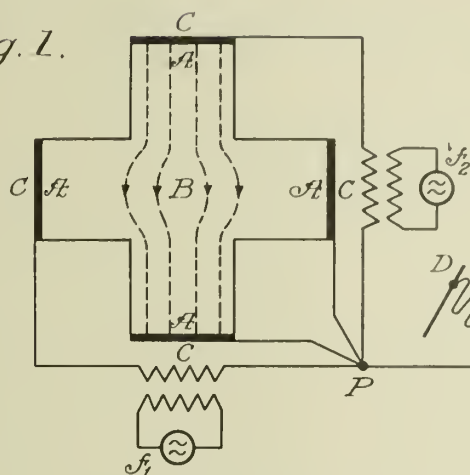


Fig. 6.

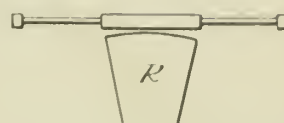


Fig. 2.

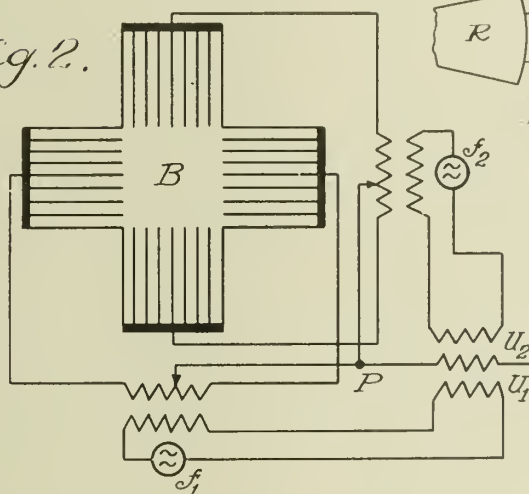


Fig. 5.

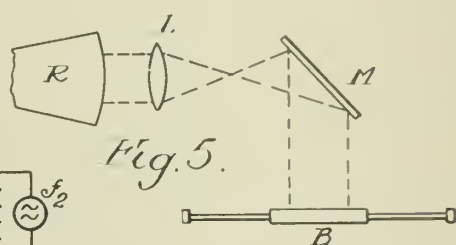


Fig. 3.

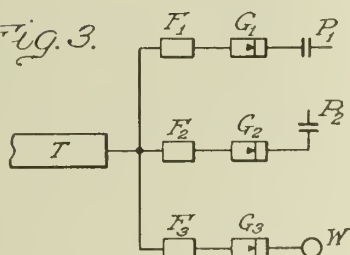
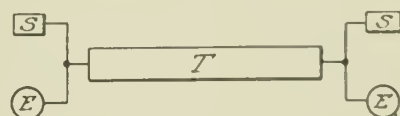


Fig. 4.



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BY Richardson & Co.  
Attorneys



# ALIEN PROPERTY CUSTODIAN

## DEVICE FOR COMPENSATING THE TEMPERATURE OF SYSTEMS FOR DISTANT MEASUREMENT OF THE NUMBER OF REVOLUTIONS

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vested in the Alien Property Custodian

Application filed October 23, 1940

The systems for measuring the number of revolutions treated hereinafter are operated by driving a dynamo (the transmitter) with the number of revolutions to be measured and by measuring at the receiving station the voltage generated by the dynamo, mostly by means of a direct current instrument via rectifiers or by means of an electrodynamic measuring instrument.

At higher temperatures of the transmitter the indication obtained in this way is reduced for two reasons: firstly, owing to the rising resistance of the windings in the transmitter, and furthermore owing to the reduction of the strength of the magnet, as shown by every magnet. The first mentioned influence is in most cases considerably greater than the latter. The copper resistance varies by 4% for each 10 degrees centigrade, and the error caused thereby is equal to the proportion of this resistance variation to the total ohm resistance of the circuit. In order to make it small, it would be necessary to use a very high constant series resistance. Since the current consumption of the indicating instrument is not optionally variable, it would be necessary to make the transmitter very strong and, therefore, large and heavy, which is mostly undesirable. The temperature variation of the magnetic flux is of the order of 0.3% for each 10 degrees centigrade, but in many cases the actually occurring error of indication, especially with large numbers of revolutions, is even of a higher order than that mentioned.

In most of the systems for distant measurement of the number of revolutions the temperature compensation of the transmitter is effected by varying the strength of the magnet in dependence on the temperature by magnetic series connection of a ring or the like consisting of an iron-nickel alloy. With increasing temperatures, a smaller number of lines of force will be short-circuited via the iron-nickel body so that the induced voltage will rise.

This method has two considerable disadvantages: (1) the reproduction of a certain course of the temperature is exceedingly difficult even with small magnetic unhomogeneities of the material or with a somewhat heterogeneous magnetization, and (2) by this way of compensating the variations due to the temperature, a systematic curve error arises at higher temperatures. With a limited current loading of the transmitter by the indicating instrument, a variation of the magnetic flux will have a comparatively greater effect upon the indication of the number of revolutions, if the number of revolutions

is higher than if it is lower, because the current intensity is not proportional to the number of revolutions, but rises more slowly with greater numbers of revolutions. As a variation of the resistance of the transmitter owing to the rising temperature causes the same relative variation of the indication of the number of revolutions for all values of the number of revolutions, the result of this is that a transmitter, which is correctly compensated for average speeds, will be over-adjusted for higher speeds and under-adjusted for lower speeds.

Apparently, the most natural way of compensation would be to insert a series resistance decreasing with increasing temperature in such a way that the error due to the temperature is compensated. However, the existing resistances of this kind either have a very large or a very small negative temperature coefficient of the electric resistance. Bodies with very large temperature coefficients are many temperature-dependent conductors, especially metal oxides. Their temperature coefficients amount to a few per cent for each degree centigrade. Consequently, the absolute variation of these resistances is considerably greater for lower temperatures than for higher temperatures. For example, the resistance of cuprous oxide resistances is reduced to one half by a rise in temperature of 30 degrees centigrade, so that the differential variation of their resistance at, for example, 50° C. will still amount to about one half of that at 20° C. On the other hand, the output of the transmitter will mostly not be sufficient to provide a sufficiently high series resistance for the compensation of temperature by means of series resistances with small negative temperature coefficients. Such resistances, for example certain kinds of carbon, have a temperature coefficient of a few tenths of a per cent for a temperature variation of 10° C. Since the temperature coefficient of copper is four per cent for 10° C., the order in the case of the series resistance would have to be ten times as large as that of the copper resistance, so that the transmitters would have to be extremely large and heavy.

According to the invention, it is possible to obtain a compensation of temperature with comparatively small series resistances, using resistances with very large temperature coefficients, by providing a series resistance in which a highly temperature-dependent conductor is connected in parallel with a resistance varying but slightly with the temperature. By correctly dimensioning the resistances, it is possible to obtain a prac-

tically completely linear dependence of the resistance upon the temperature. If necessary, there may also be inserted in the system a small temperature-dependent series resistance, in order to obtain a more improved linearity. A still more improved linear or, if necessary, not linear dependence upon the temperature may be obtained by inserting (mixed series and parallel connection) additional highly or slightly temperature-dependent resistances so as to form a network. With this arrangement, it is generally possible to obtain a practically completely sufficient linear compensation of temperature with a series resistance which, in total, at the lowest temperature occurring, is about double the amount by which it must be reduced when the temperature rises.

As, apart from the influence of the copper resistance, also the magnet in the transmitter causes a reduction in the indication at higher temperatures (variation of the remanence by about  $-0.3\%$  for  $10^\circ \text{C.}$ ) it is necessary, if an iron-nickel shunt is to be altogether avoided, to cause a certain additional linear reduction of the total resistance, which compensates the temperature coefficient of the magnet. It should amount to about  $0.3\%$  for each  $10^\circ \text{C.}$  The result of this is that an irregularity of the temperature compensation is caused for different numbers of revolutions, being in the reverse order as in compensating the influence of the copper resistance by means of magnetic shunt (see above) and generally to a considerably smaller amount. Therefore, the transmitter is now still under-compensated for large numbers of revolutions and over-compensated for small numbers of revolutions, if it is correctly compensated for average numbers of revolutions. This still remaining error may be compensated according to the invention by the self-heating of the temperature-dependent conductor as the current passes through. As the semi-conductor is connected in parallel with an approximately or completely constant resistance, whereas its resistance is considerably smaller at higher temperatures, a larger current passes through at higher temperatures, still more reducing the resistance owing to self-heating. Of course, this occurs to the greatest extent in case of high numbers of revolutions, since the current is then the largest. Consequently, the current and, therefore, the indication is increased in case of higher temperatures and of higher numbers of revolutions, which counteracts the above mentioned error. By a suitable heat insulation of the temperature-dependent conductor this compensating effect may be dimensioned so as to obtain a practically complete compensation of the error due to the temperature at different numbers of revolutions.

In order also to obtain a correct indication in locally not uniform temperatures of the transmitter, it is advisable to mount the temperature-dependent conductor as near as possible to the copper coils of the transmitter, for example to insert it between two coils or to wind it into one of the coils. The above mentioned optimum heat insulation may in this case be effected by provid-

ing the resistance beforehand with a heat-insulating cover. If the heat insulation is too high, this may be relieved by providing two resistances of equal size or one resistance of larger dimensions which will then, of course, be less self-heating.

As, furthermore, not only the transmitter but also the indicating instrument is influenced by the temperature, frequently in another way than the transmitter, there may also be provided compensation of temperature in the indicating instrument in the manner described above in order to avoid errors caused thereby. All considerations mentioned above also apply in this case.

A constructional example of the object of the invention is illustrated diagrammatically in the accompanying drawing, in which:

Figs. 1 and 2 show circuit diagrams of the transmitter (Fig. 1) and of the indicating instrument (Fig. 2).

Fig. 3 is an axial section through the transmitter, and

Fig. 4 is an interior view of the indicating instrument.

In Figs. 1 and 3 of the drawing, 1 designates the revolving magnet, 2 the individual coils, 3 the temperature-dependent resistance, 4 the temperature-independent resistance connected in parallel, and 5 the series resistance.

According to Fig. 3, the magnet 1 is fixed to the shaft 6 which is driven in a suitable manner from the shaft whose number of revolutions is to be determined. The magnet is rotatably mounted with ball bearings 8 in the housing 7.

The coils 2 are influenced in known manner. The one end of the coils is connected to the line  $x$ , whereas the other end of the coils is connected on the one hand to the temperature-dependent resistance 3 (connection  $a$ ) and on the other hand to the temperature-independent parallel resistance 4 (line  $b$ ). The temperature-dependent resistance 3 is connected via the line  $c$  to the parallel resistance 4. The series resistance 5 is connected to the line  $y$ . From the lines  $x$  and  $y$  the current generated by the transmitter may be derived and conducted to the measuring instrument as shown in Figs. 2 and 4. The measuring instrument substantially consists of a housing 9. In the housing there is pivoted a pointer 10 which is provided with the moving coil 11. The moving coil 11 moves over the pole of an iron core 12 upon which is wound a field coil 13. Furthermore, there are arranged in the housing the series resistance 14 and the temperature-independent parallel resistance 15. The number 16 designates the temperature-dependent resistance. These individual parts are connected in such a manner that the current is conducted from the line  $x$  to one end of the series resistance 14. The resistance 15 arranged behind the series resistance is connected in parallel with the temperature-dependent resistance 16 via the lines  $d$  and  $e$ . The coil 11 and the field coil 13 are connected in series and have a connection via the line  $f$  with the line  $y$ .

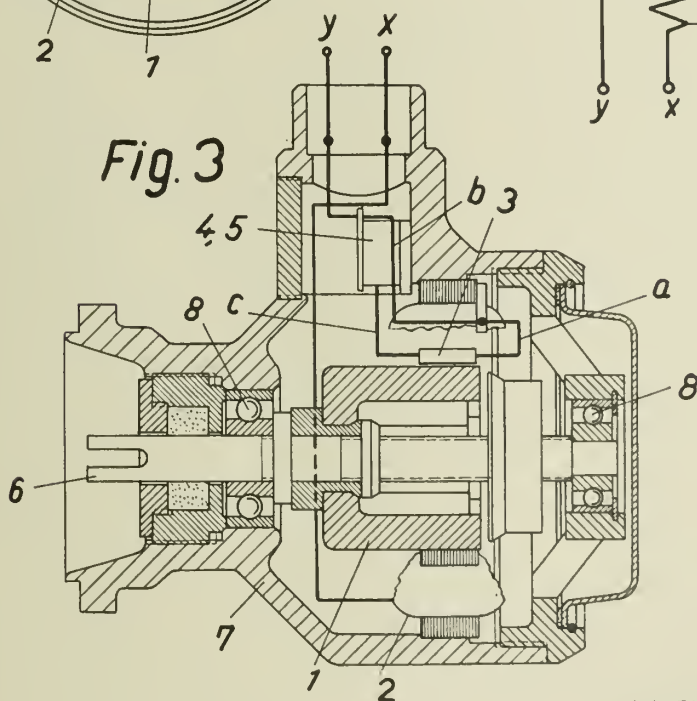
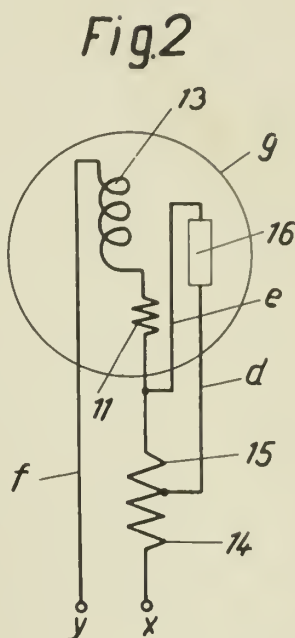
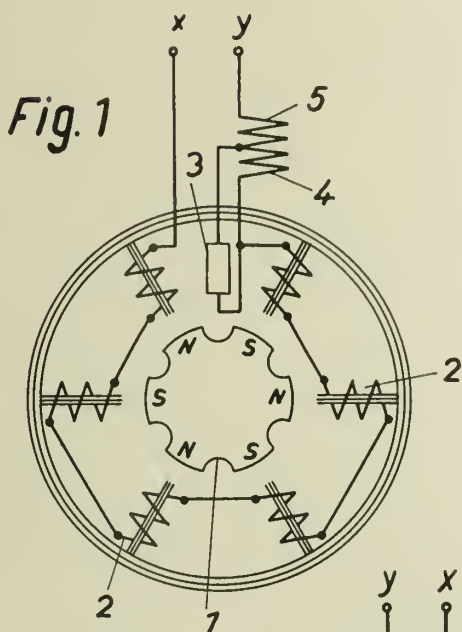
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2 Sheets-Sheet 1



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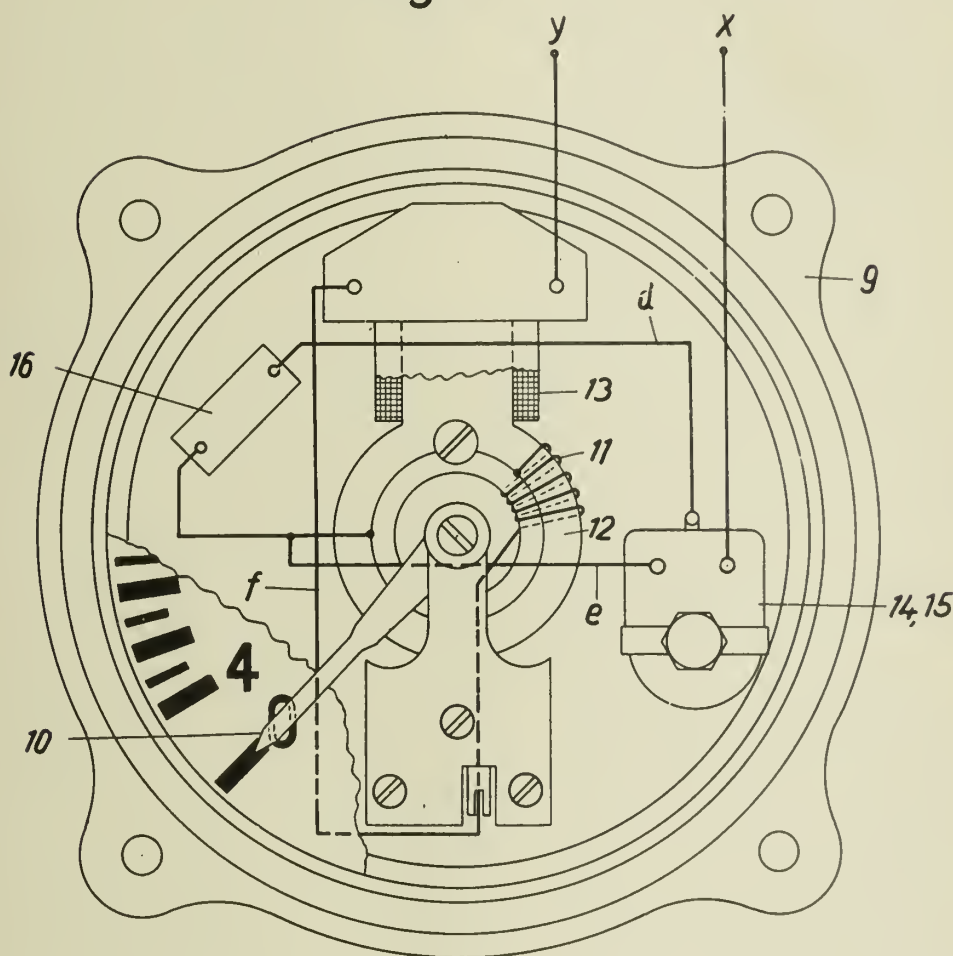
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 DEVICE FOR COMPENSATING THE TEMPERATURE OF  
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2 Sheets-Sheet 2

Fig. 4



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ALIEN PROPERTY CUSTODIAN

DRY RECTIFIERS

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This invention relates to rectifiers of the kind comprising so-called valve discs and consists in certain features of novelty which will appear from the following description, reference being had to the accompanying drawing, in which

Fig. 1 is a fragmentary sectional view of a prior arrangement improved by the invention, Fig. 2 is a fragmentary partially sectioned view illustrating an example of devices as provided by the invention, Fig. 3, drawn to a larger scale than Figs. 1 and 2, is a fragmentary sectional view of a valve disc which is a modification of the discs represented in Fig. 2.

For the sake of clearness the plates and layers constituting the valve discs are shown larger in thickness than they really are.

The valve discs represented in Figs. 1 and 2 are in well-known manner each composed of a base plate electrode 1, a semi-conductor layer 3 carried by plate 1, the so-called counterelectrode 5, produced by spraying metal against layer 3, and the so-called blocking layer 7 that forms between the layers 3, 5 during the manufacture of the valve discs. These rectifying valve discs 1, 3, 7, 5 have each a central bore 2 provided in the plate 1. The bores 2 are to receive a mandrel composed of a spindle 8 and an insulating tube 9 inserted over this spindle. The valve discs are serially mounted on the mandrel 8, 9.

The prior arrangement illustrated in Fig. 1 has insulating discs 10 and resilient contact plates 11 likewise mounted on the mandrel 8, 9 and disposed between the valve discs. The plates 11 are arranged to contact with the counterelectrodes 5 and base plate electrodes 1 and thus serve to interconnect the valve discs. The discs 10 bear against the layers 3 and plates 11 and are surrounded by the counterelectrodes 5. They are thick enough to provide for cooling interspaces 12 between the valve discs.

The arrows in Fig. 1 are to indicate that the valve discs, the discs 10 and plates 11 are pressed together. This may be done by a means of the kind shown in Fig. 2, namely, nut screws 13 mounted on spindle 8.

The present invention enables the interspaces 12 to be provided without the aid of additional contact plates, such as the plates 11, Fig. 1, whereby devices according to the invention are simpler and cheaper than the prior ones. To such end the contact plates 11 are each replaced by an extension A of the counterelectrodes 5, as will be seen in Figs. 2 and 3. In the example shown in Fig. 2, metal discs 6 are arranged on mandrel 8, 9 to contact each with one of the extensions A and the adjacent base plate electrode 1, so as to interconnect this plate and the adjacent electrode 5. By means of the discs 6 cooling interspaces 12 of the desired width are pro-

vided between the valve discs. The extensions A are separated from the layers 3 by annular insulating means which preferably are constituted by a lacquer coating 4 on the layers 3. The valve discs are pressed together by the nut screws 13 of spindle 8. The coatings 4 prevent the plates 1 and electrodes 5 from becoming interconnected in the zone of pressure by the pressure destroying in this zone the layers 3. Interconnection of the parts 1, 5 would cause the blocking layer 7 to be short-circuited.

Preferably an interspace 14 is provided between the extensions A and tube 9, that is to say, when spraying metal against layer 3 and coating 4, thus producing the electrode 5, the inner edge of the coating 4 is left free from such metal, which otherwise might enter the bore 2 so as to interconnect the parts 1, 5 and thereby to short-circuit the blocking layer 7. Equally, as shown in Figs. 1 and 2, the outer edge of layer 3 should be free from metal. In fact, the semi-conductor layer 3 sometimes has fissures or cracks in its outer edge or is crumbled off there, whereby the metal sprayed against layer 3 might be able to interconnect the parts 1, 5, thus short-circuiting the blocking layer 7 also in this case.

The lacquer coating 4 may be applied to layer 3 by stamping or rolling or any other suitable method.

In the case of selenium as semi-conductor the lacquer coating 4 may be applied to the semi-conductor layer 3 while this is still amorphous or may be applied to it after the selenium has undergone the first step of the well-known forming process, whereupon the assembly 1, 3, 4 is placed in a furnace in which the forming of the selenium is completed while at the same time coating 4 is burnt onto the selenium.

According to Fig. 3 the lacquer coating 4 may be produced as follows. On the semi-conductor layer 3 metal is sprayed to form a layer 5' which does not cover a central zone of layer 3, namely, a zone of the size of the desired coating 4. The assembly 1, 3, 5' is then provided with a lacquer coating 15 by dipping or spraying. In this way coating 4 is obtained as a part of the coating 15. On coating 15 a second metallic layer 5'' is produced by spraying metal against it. The metal so striking the coating 15 acts to destroy it at points where layer 5', being produced by dipping or spraying, has raised portions. At these points the layer 5'' will hence contact with layer 5' and thus constitute a counterelectrode 5', 5'' equivalent to that designated 5 in Fig. 2. In order to give a pictorial idea of this the dotted line in Fig. 3 represents by way of example the surface of the coating 15 before the layer 5'' is produced on it.



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Fig. 1

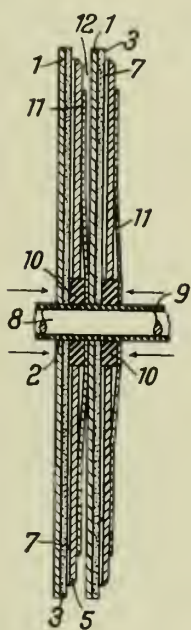


Fig. 2

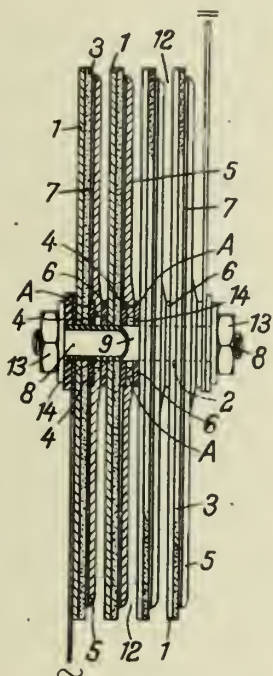
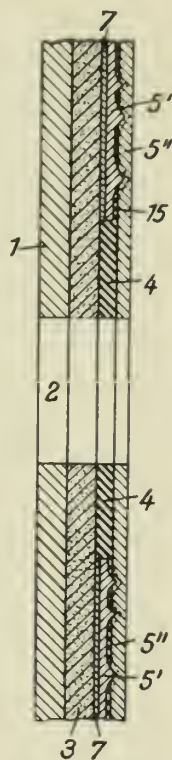


Fig. 3



Case 7-18-41

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# ALIEN PROPERTY CUSTODIAN

## ONE WAY CLUTCH ARRANGEMENT

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Application filed October 24, 1940

The one way clutch device subject of the present invention has the object:

(a) Of blocking a transmission driving shaft rotating round its axis in such a way as to prevent its rotation in one direction and allow its free rotation in the other.

(b) Of determining at will the direction in which the shaft is to be blocked, and consequently the direction in which the shaft is allowed to rotate freely.

Ordinary brakes do not usually act directly on the shaft, but on a pulley (or sleeve, or disc, or drum) keyed to the shaft, solidary with the same, and constituting the intermediate member between shaft and braking assembly.

To attain the first object indicated in the present exposal it is sufficient to key the pulley through a freewheeling device onto the shaft in such a way as to render it solidary with the same during rotation in one direction, and to enable it to keep still if the shaft rotates in the opposite direction. Even better, the pulley may be formed of two parts: an inside member completely solidary with the shaft and an outside member consisting of a circular crown joined through a freewheeling device to the inside member. When the brake acts blocking the outside circular crown the shaft will be blocked in one direction and only able to rotate in the other.

The division surface of the pulley members, moveable relatively to one another, may be flat and at right angles to the shaft, instead of being cylindrical and coaxial to the same. In this case one may define the pulley as consisting of two members: the first being solidary with the shaft and the second, contacting the first along a flat circular surface, and being obliged to follow the former during rotation in one direction, while in the other direction the two faces may glide freely or with very slight friction on each other.

The above mentioned disposition relates to hand brakes, but it is obvious that it can also be extended to other types of brake (block brakes, centrifugal brakes, friction brakes) accordingly said disposition may be also applied when, instead of a pulley, a sleeve, disc, or drum is used.

Lastly, the freewheeling device may, instead of being inserted between pulley and shaft or between the two members constituting the pulley, be altogether an integral part of the brake system and be completely detached from the shaft when the brake is off; this system avoids the noise of the freewheeling and is better illustrated in the drawings.

One may vary the choice of the type, the ex-

tension of the braking surface, the distance between the freewheeling unit and the shaft axis (lever arm) according to the angular speed, the power transmitted, the inertia of the masses that are to be immobilised and the time within which one wishes to attain the braking.

To attain the second object indicated in the present description two pulleys (sleeves, discs or drums) must be used instead of one, both constructed in the aforesaid manner, the first being furnished with a freewheeling unit having a clockwise movement, the other being provided with a freewheeling unit having a counterclockwise movement. The braking system must be able to act at will on either pulley. The freewheeling unit may, also in this case, be inserted in the braking assembly instead of on the intermediate member; with this system a single pulley is sufficient.

The braking disposition object of the present invention is advantageously applied to transmission driving shaft of motor vehicles instead of the actual hand brakes, with the object, for instance, of allowing a vehicle to start uphill with the brakes off, as if it were on level or propped, without any danger of regression and without having to accelerate excessively, at the same time reducing to the minimum the friction and the friction lining wearing.

This disposition is particularly useful for transporting heavy loads on steep slopes or for when it is necessary to go into back gear to turn a vehicle round on a slope or on the edge of cliffs; its use is also particularly advantageous for obtaining greater safety and for military uses as it facilitates the driving of motor vehicles thus increasing the number of persons to whom one may entrust a vehicle in difficult conditions.

It is quite easy to apply this disposition as in most cases the hand brake is not used to reduce a rotating shaft to zero speed but only to prevent a shaft that is or passes through zero speed from starting rotation.

A similar disposition may be applied to expansion brakes on the wheel drums of motor vehicles or lorries when they are furnished with matched wheels, the movement of the first being clockwise and that of the second counterclockwise.

In the accompanying drawings:

Fig. 1 is a front elevation, with parts broken and omitted, showing diagrammatically a shaft provided with a one way brake arrangement according to the invention.

Fig. 2 is a cross section on line II—II of Fig. 1. Fig. 3 is a cross section on line II—II of Fig. 1,

Fig. 4 is a modification of the arrangement disclosed in Fig. 1.

Fig. 5 is a cross section on line V—V of Fig. 4.

Fig. 6 is a cross section on line VI—VI of Fig. 4.

Fig. 7 is a further modification of the arrangement disclosed in Fig. 1.

Fig. 8 shows another embodiment of modification of Fig. 7.

With reference to Fig. 1, a shaft 1 carries two one way clutch devices 2 and 3, details of which are visible on Figs. 2 and 3. Each of said devices 2 and 3 comprises a central disc 4, 4', keyed on said shaft 1 and surrounded by a ring or annular member 5, 5'. In the annular space between disc 4 and ring 5 a one way clutch unit 6 and 7 is interposed, respectively. Unit 6, as seen in Fig. 2, allows disc 4 and shaft 1 to rotate clockwise in respect of ring 5, while unit 7, as seen in Fig. 3, allows disc 4' and shaft 1 to rotate counterclockwise in respect of ring 5'. Rings 5 and 5' are subjected to braking by hand brakes 8 and 8'. Brake 8 acts to prevent clockwise rotation of ring 5, and brake 8' acts to prevent counterclockwise rotation of ring 5'. Brakes 8 and 8' are fast on a pivot 9, 9' at one end of the brake band, and are joined through connecting rods 10, 10' to one end 11 of a lever 12 pivoted in 13, (Fig. 1). Control lever 12 is shown in its middle position wherein the two brakes 8 and 8' are released and therefor shaft 1 is free to rotate in either direction. Lever 12 may be adjusted in respect of a toothed rack 14 and cooperates with rack teeth 15 by means of a pawl 16 which is controlled by a control knob 17 lodged in lever handle 18.

When lever 12 is shifted to the left, brake 8 is set through a leverage not illustrated in the drawing, of the usual type, and consequently shaft 1 can only rotate in a clockwise direction. Whereas when lever 12 is shifted to the right brake 8' is set through another leverage, and shaft 1 is only free to rotate in a counterclockwise direction.

According to Figs. 4, 5 and 6 wherein the same parts are indicated by the same reference numerals, two one way clutch devices 2 and 3 are both mounted on the same side of shaft 1 relative to control lever 12, and operation is the same as above disclosed in respect of said first embodiment of Fig. 1. Figs. 5 and 6, showing one way clutch devices 2 and 3 does not need any particular explanation.

According to Fig. 7, shaft 1 is provided with two discs 19 and 20 keyed thereto. On shaft 1 two one way clutch devices 21 and 22 are mounted in such a manner, that they can axially slide on said shaft in order to approach and come into contact with discs 19 and 20.

One way clutch devices 21 and 22 comprise a sliding sleeve 23 and 23', operated by control lever 12 through leverages 24, 24'. On sleeves 23 and 23', which can only axially slide but not rotate, a disc member 25, 25' is fixedly mounted and bears rotary friction rings 26, 26', a one way clutch being interposed between discs 25, 25' and rings 26, 26'. Said one way clutches are adapted to let rings 26, 26' freely rotate in contrary directions. When one of the rings 26, 26' comes into contact with cooperating discs 19, 20, and a pressure is axially exerted in order to connect by friction one of said rings with one of said discs, then shaft 1 is permitted to rotate only in one direction. By shifting lever 12 from one to the other of its end positions, one way clutch devices 21 and 22 come alternatively in operation and therefore shaft 1 is alternatively allowed to rotate in either direction.

According to Fig. 8, which is a very conventional modification of the device shown in Fig. 7, only one disc 27 keyed on shaft 1 is employed instead of two discs 19 and 20 of the embodiment of Fig. 7, and one way clutch devices 21 and 22 operate on the two sides of disc 27. The remaining parts are quite similar to those of Fig. 7 and are denoted with the same numerals.

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Fig. 2

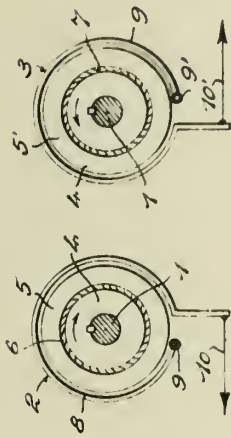


Fig. 6

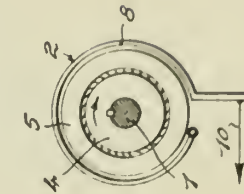


Fig. 5

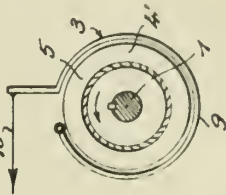


Fig. 1

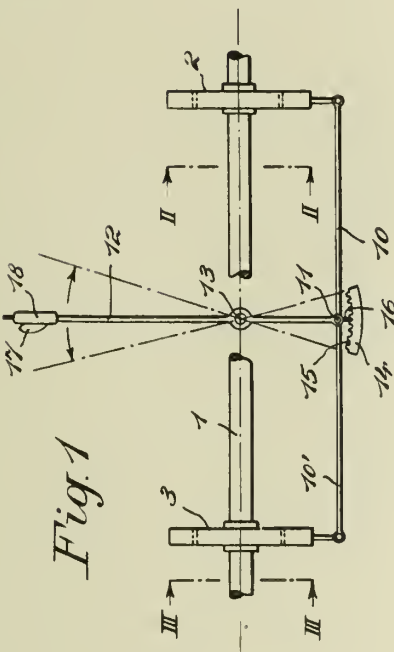
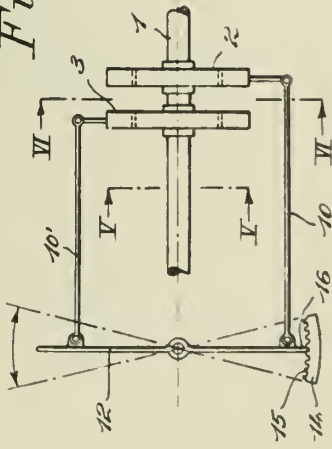


Fig. 4



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Fig. 8

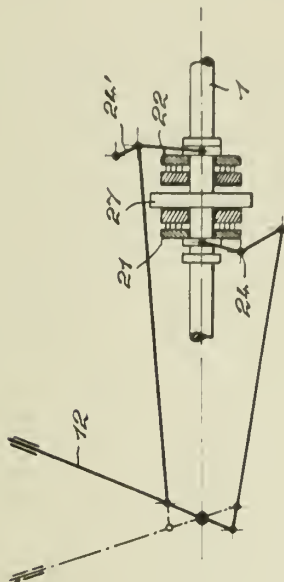
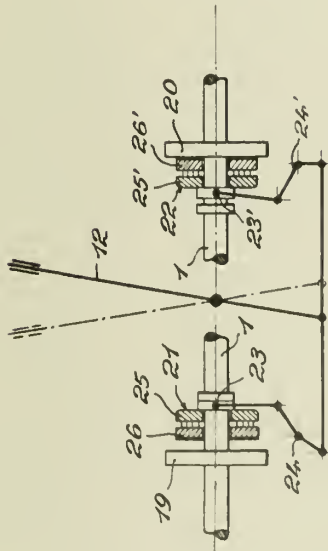


Fig. 7



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ALIEN PROPERTY CUSTODIAN

ELECTRICALLY OPERATING REGULATING  
DEVICE

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Application filed October 24, 1940

The invention relates to an electrically oper-  
ating regulating device in which a two-phase  
motor, preferably a Ferraris motor, serves to ad-  
just the regulating member (throttle, valve or the  
like), the control current of said motor being  
controlled by means of a relay in response to a  
regulating impulse acting thereupon. In the  
application Ser. No. 293,524 it is explained what  
advantages result in the use of Ferraris motors  
for regulating purposes. More particularly the  
invention relates to a regulating device of the  
aforementioned structure in which the two-  
phase motor with its control winding is connect-  
ed to a diagonal branch of an a. c. fed resist-  
ance bridge, which is unbalanced by any devia-  
tion of the actual regulating value from the de-  
sired regulating value. To this end a potenti-  
ometric resistance connected to one diagonal  
bridge branch and controlled by the regulating  
impulse—preferably an electrolyte potentiom-  
eter—may serve as relay. Consequently upon a  
deviation of the actual regulating value from the  
desired regulating value, the a. c. voltages at the  
potentiometric resistance, which balance at the  
desired regulating value, are varied in opposite  
senses with the result that an a. c. flows in the  
control winding of the two-phase motor, the am-  
plitude and phase of which current corresponds  
to the value and direction of the deviation of the  
actual value from the desired value.

For some purposes, as for instance for remote-  
control, it may be necessary to keep the potenti-  
ometer dimensions small, which calls for a reli-  
able amplifier. According to the invention, in  
the above mentioned arrangement, which pro-  
vides the control winding of the two-phase motor  
in one diagonal branch of an a. c. fed bridge, two  
saturable inductances magnetically biased by  
direct current form the a. c. resistances in the  
one bridge branch, the biasing currents of which  
are variable in opposite sense in dependence on  
the regulating impulse.

The subject matter of the invention is ex-  
plained in greater detail with reference to the  
accompanying drawings, of which

Fig. 1 represents a diagrammatic view of an  
arrangement according to the invention, and

Fig. 2 a diagram showing a resonant charac-  
teristic obtained by using a biased saturable in-  
ductance.

The liquid potentiometer 8 (Fig. 1) having  
outer electrodes 8', 8'' and a movably mounted  
middle electrode 12 is series connected with pri-  
mary windings P<sub>2</sub>, P<sub>3</sub>, respectively, of two trans-  
formers T<sub>2</sub>, T<sub>3</sub> being alike in construction and

arranged on either side of the potentiometer, to  
the secondary winding S<sub>1</sub> of a transformer T<sub>1</sub>  
fed from the a. c. network RS. The middle elec-  
trode 12 of the potentiometer 8 is electrically  
connected to a center tap 10 of the secondary  
winding S<sub>1</sub> and controlled by an impulse trans-  
mitter of any kind (not shown). The secondary  
windings S<sub>2</sub>, S<sub>3</sub> of the transformers T<sub>2</sub>, T<sub>3</sub> are  
connected to the input terminals of the full  
wave rectifiers G<sub>1</sub>, G<sub>2</sub>, the output terminals of  
which deliver the current for magnetically bias-  
ing the saturable inductances D<sub>1</sub>, D<sub>2</sub> which act  
as amplifiers. Each of the inductances D<sub>1</sub>, D<sub>2</sub>  
possesses two two-legged cores 1, 2 and 3, 4, re-  
spectively, which carry a. c. winding W<sub>1</sub>, 2 and  
W<sub>3</sub>, W<sub>4</sub> respectively, simultaneously serving for  
direct current biasing. Such amplifying devices  
are based on the principle of influencing the  
self-induction of an a. c. fed induction coil by  
a d. c. bias. Each winding is in known manner  
so arranged as to form a bridge, the rectifier  
output terminals being connected to one of the  
diagonal branches. On the other hand the  
other of the diagonal branches together with the  
secondary winding S<sub>4</sub> of a transformer T<sub>4</sub> fed  
from the a. c. network RS form a bridge, in  
whose diagonal branch are series connected one  
field winding of a Ferraris motor FM, preferably  
of the drum type, the other motor field winding  
being fed by the network RS, and a condenser C,  
the latter effecting the phase displacement of  
the two fields required to drive the Ferraris mo-  
tor.

Currents J<sub>1</sub> and J<sub>2</sub> flowing in the two respec-  
tive potentiometer bridge branches are of equal  
value in the middle position of the middle elec-  
trode 12 of the potentiometer 8. Consequently  
the two saturable inductances D<sub>1</sub> and D<sub>2</sub> are  
equally saturated by d. c. so that their self-in-  
duction is likewise equal. Hence the bridge, to  
whose diagonal branch the Ferraris motor is  
connected, is balanced. At a displacement of the  
center electrode 12 of the potentiometer 8 the  
one of the inductances D<sub>1</sub>, D<sub>2</sub> is more strongly  
biased and simultaneously the other inductance  
is less strongly biased. In consequence the ratio  
of self-induction of D<sub>1</sub> and D<sub>2</sub> varies, and the  
bridge will be unbalanced so that the Ferraris  
motor due to the differential current in the di-  
agonal branch of the bridge runs in the corre-  
sponding rotary direction and at corresponding  
speed. The arrangement in addition possesses  
the advantage of a rectilinear regulating char-  
acteristic, as the currents J<sub>1</sub> and J<sub>2</sub> are linearly

dependent of the resistance ratio of the potentiometer.

Saturable a. c. fed inductances having a variable d. c. bias are of unlimited durability and possess small dimensions. The special advantage of the arrangement according to the invention consists in the possibility of effecting a control of the Ferraris motor as to speed and direction of rotation by means of only two amplifying devices.

The d. c. for magnetically biasing the saturable inductances are advantageously produced by using an a. c. fed potentiometric resistance controlled by the regulating impulse and connecting each of the two a. c. voltage drops occurring at the potentiometer taps to a rectifier, the output terminals of which supply the direct currents for biasing the two amplifying devices. This arrangement affords the advantage that a. c. voltages in the zero range may be more easily governed by a relay control member subjected to only slight control forces than is the case in direct control of d. c. voltages.

The condenser C above described serves an additional purpose. As is known, the series connection of a capacitor and an inductance is in resonance with the net frequency, provided the two a. c. resistances are of equal value. In this case the resistance of the circuit is equal to its

ohmic resistance and the current has reached its greatest intensity. If the ratio of the capacitive and the inductive resistances relative to one another is varied, the resonance becomes impaired and the current is reduced on both sides of the point of resonance. If therefore the capacity C is maintained constant while the self-induction L of the amplifier is varied, a current  $I=f(L)$  results, as shown in Fig. 2. It is now possible to choose the initial self-induction of the amplifiers so as to work on a certain portion of the curve in the course of the operative changes of the inductances, i. e. the steepness of the regulating characteristic may be adjusted. This characteristic will accordingly vary corresponding to whether the point A or the point A' is chosen as starting point, these points lying in curve sections of different steepness. The variation in self-induction is designated by  $a$ , which corresponds to a certain displacement of the potentiometer center electrode. By proceeding in the manner described a slight change in inductance of the amplifiers will not only cause a great variation in the controlling current for the Ferraris motor but the steepness at which the current variation occurs can best be adapted to the respective requirements.

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PUBLISHED

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BY A. P. C.

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ELECTRICALLY OPERATING REGULATING DEVICE

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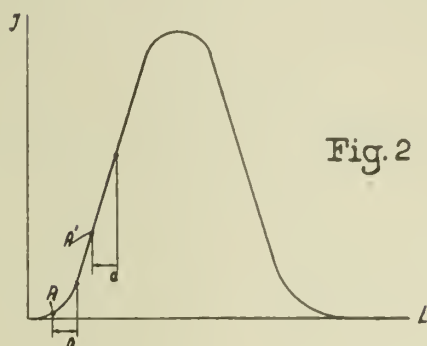


Fig. 2

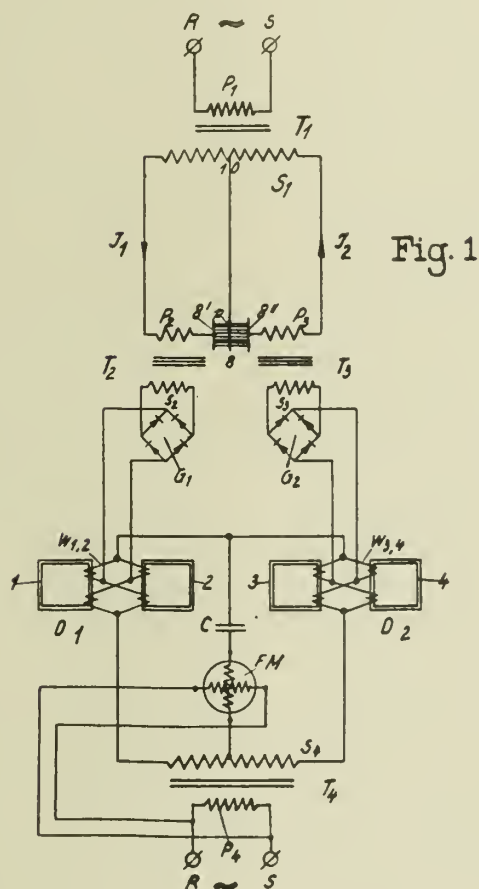


Fig. 1

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# ALIEN PROPERTY CUSTODIAN

## PRESS FOR MANUFACTURING TUBES, RODS OR THE LIKE

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Application filed October 25, 1940

This invention relates to a press for manufacturing tubes, rods or the like, particularly to cable covering presses in which molten metals, for instance, aluminum or aluminum alloys are poured into a container.

In the known presses for the manufacture of hollow articles and cable covering presses as well which serve to extrude solid or molten materials, a container is employed whose bore is, as a rule, slightly, for instance, one millimeter greater than the diameter of the extrusion die head. If a molten material is to be extruded, for instance, lead or aluminum is poured into the container a very thin layer corresponding substantially to the difference in diameters between the die head and the bore of the container is generally formed around the die during the extruding stroke. When refilling the container, the above-mentioned layer which remains therein fuses again together with the molten material freshly poured into the container and a very thin layer is again formed during the following extruding stroke. This is repeated during each extruding stroke.

The presses hitherto known present the disadvantage in that the highly heated material to be extruded exerts a detrimental thermal-technological action on the walls of the container or of the liner arranged, as a rule, in the same and consisting of highly tempered steel. The material of the container or the highly tempered steel of the liner is subjected to a premature destruction as a result of heating cracks caused by the high temperature of the material to be extruded which, for instance, amounts in the case of lead to about 400 centigrades and in the case of aluminum to about 450 centigrades. Apart from the formation of heating cracks there is, however, also another thermal-technological drawback, since also the highly tempered steel of which consists the liner is impaired by the fact that the strength of this material is considerably reduced owing to the repeated pouring of the molten material into the container. In this case an annealing of the steel is effected so that the steel can no longer fulfil the desired requirements.

When extruding some materials, for instance, molten aluminum or molten aluminum alloys it has further been found that the steel walls of the container or of the steel liner arranged in the container with which the hot molten material comes into contact are subjected to chemical reactions. In this case parts of the steel are dissolved and mixed with the material to be extruded. They are extruded with the latter and pass into the product, for instance, into the cable

sheath. The drawback is thus presented in that on the one hand the walls of the container or of the steel liner are gradually destroyed and that on the other hand the amount of steel absorbed by the aluminum or the like impairs the quality of the product; i. e., the flexibility, the weldability and the resistance to corrosion of the cable sheath are impaired by the undesirable admixture of steel when manufacturing a cable sheath.

The present invention has for its object to avoid the above-mentioned drawbacks which occur when operating the presses hitherto known. The invention consists in the fact that the container of the press or a liner arranged therein has a bore enlarged to an amount which is greater than is, as a rule, usual and which serves for the reception or the formation of a thick protective layer. In this manner, the molten material to be extruded, for instance, lead or aluminum is prevented from coming directly into contact with the steel wall of the container or of the liner. Consequently, the above-mentioned detrimental thermal-technological and chemical actions of the molten material cannot occur on the wall of the container or of the liner.

Different forms of the invention are possible which will hereinafter be dealt with.

Thus, for instance, the bore enlarged according to the invention may be lined with a material which either consists of the same or of approximately the same material as the material to be extruded. For instance, the lining material corresponding to the material to be extruded may consist of the purest aluminum, or pure aluminum or of an aluminum alloy. In this case the liner of the enlarged bore is formed by itself, insofar as a jacket not extruded by the die is left after each extruding operation.

The above-mentioned enlarged bore may further be lined with a material which has a higher fusing point than that of the material to be extruded and is therefore insensitive to heat with respect to the material to be extruded. The material lining the enlarged bore may also be harder than the material to be extruded. Furthermore, a material having a higher fusing point and/or being harder than the material to be extruded may be provided in an outer zone of two tubular concentric zones within the enlarged bore, whereas a material similar to the material to be extruded may be provided in an inner zone within said bore and facing the extrusion die. Various materials may be therefore employed in combination in lining the container, such as, for instance, an alloy having a high fusing point and a

material which consists of the same or of approximately the same material as that to be extruded. Consequently, a hard aluminum alloy may be employed for the outer jacket and purest or pure aluminum for the inner jacket. In the latter case, the liner lying next to the extrusion die is again formed by itself by the fact that a jacket not extruded by the die is left after each extruding operation.

In the enlarged bore also a bush may be provided which fills up only in part in the radial direction the zone limited on the one hand by the jacket surface of the die head and on the other hand by the enlarged bore. The above-mentioned bush may be provided with perforations for equalizing the difference in pressure. By the arrangement of these perforations the material to be extruded may pass through these perforations when pouring the molten material into the container or as a result of the pressure caused by the extrusion die so that the pressure internally and externally of the bush is equalized and therefore the material of the bush is not subjected to excessive stresses which might impair the life of the bush.

Furthermore, the bush may consist of a pressure-tight metal which is as far as possible not subjected to corrosion and is resistant to wear, such as, for instance, steel bronze. In this case, it is preferable to employ a bush having relatively thin walls and to embed under pressure at least its outer jacket end, if necessary, also the inner jacket into a molten metal. By the use of a relatively thin bush a saving in material is effected. The bush may also be made of a non-metallic, for instance, ceramic material. The heat resistant but under certain conditions very fragile ceramic jacket is preferably embedded in molten metal.

In the cases mentioned above the advantage is attained according to the invention in that the molten lining material in the enlarged bore comes into contact only once during the first charge with the steel walls of the container or of the steel liner arranged therein and then solidifies. By the next following charges the lining material cannot be fused, if this material has a higher fusing point than the material to be extruded. But even if the liner consists of the same or approximately the same material as the material to be extruded only a small portion of the lining material can be molten during the subsequent charge of the container provided that the wall of the liner is chosen according to the invention sufficiently thick, since the jacket remaining in the enlarged bore at the end of the extruding stroke solidifies and the molten material supplied during the subsequent extruding stroke can fuse only a small portion of the inner surface of the jacket left back in the enlarged bore. The molten material to be extruded is therefore prevented with certainty from coming regularly into direct contact with the steel walls of the container or of the liner arranged therein. The danger of a premature destruction of the container walls or of the walls of the steel liner owing to the formation of heating cracks or to an annealing of the steel is therefore avoided with certainty. Also a pitting of said walls owing to the chemical action of the molten material to be extruded and also a contamination of the same is prevented.

The enlarged bore according to the invention may at best take up only a portion of the length of the container, whereas at both ends of the container the bore is restricted to the necessary

amount. In this manner, the advantage is presented in that a flow of the lining material in the longitudinal direction of the container is prevented. In order to prevent to a further extent a flow of the lining material in the longitudinal and the transverse direction of the container under the action of the pressure, the enlarged bore is further provided with comb-like depressions which are filled up with the lining material. These comb-like depressions may be given the shape of annular grooves, whose cross-section may have any suitable form. The annular grooves are preferably given a dove-tail shape in order that they firmly retain the lining material. In this manner a wandering of the lining material in the axial direction as well as an escape of this material inwardly in the radial direction to the axis of the container is prevented.

These comb-like depressions are preferably arranged in the outer jacket surface of a tubular zone filled up with the lining material and which is adjacent to the extrusion die. Consequently, the comb-like depressions do not extend to the extrusion die but are separated from the die by a tubular layer of the lining material. This layer is preferably chosen so thick that the comb-like depressions or the amounts of the lining material arranged therein are not uncovered when recharging the container with molten material to be extruded.

Furthermore, the parts which are easily subjected to wear and arranged at the end of the container may preferably be provided with easily interchangeable pressure-tight bushes. In this manner a saving of material is effected.

In the accompanying drawings are shown several embodiments of the invention in diagrammatic form in which

Figs. 1 to 6 are vertical sectional views of different forms of a cable covering press according to the invention.

The container of the cable covering press in Fig. 1 is provided with a vertical pressure jacket 1 consisting of forged steel and in which is arranged a liner 2 made of highly tempered steel. In the liner 2 the extrusion die 4 provided with a head 3 may move in the upward and downward direction. At the lower end of the container is arranged in the known manner the extrusion head 5 carrying the extrusion tools. The jacket 1 and the liner 2 serve to take up the pressure exerted in the interior of the liner and employed to drive the extrusion die.

The steel liner 2 which in the known cable covering presses has a bore only about 1 mm greater than the diameter of the die head 3 is provided according to the invention with a bore 6 which is, for instance, 12 mm or more greater than the bore of the hitherto known cable covering presses and which serves for the reception or the formation of the protective layer to be hereinafter described. The bore of the liner 2 is restricted at the upper and lower end as indicated at 7 and 8 to the desired diameter.

The enlarged bore 6 is filled up in the embodiment according to Fig. 1 with a material consisting of the same metal to be extruded, for instance, purest aluminum or pure aluminum or with an aluminum alloy. If the press is, for instance, to be employed to extrude molten purest aluminum the entire inner space of the liner 2 is at first filled up with the molten material to be extruded which comes into engagement only the first time with the material of the liner 2 at the surface formed by the enlarged bore 6. At the end of the

first downward stroke of the extrusion die 4 a layer 9 of the material to be extruded remains in the tubular zone which extends from the upper to the lower end of the bore and which is limited on the one hand by the bore 6 and on the other hand by the jacket surface of the extrusion die head 3, which layer solidifies together with the residual amount 10 of the molten material under the die head 3. The solidified layer 9 forms for the further operation of the press a protective layer which prevents with certainty the above-described destruction of the inner walls of the liner 2.

By the restricted portions 7 and 8 of the liner 2 a flow of the lining material 9 is prevented in the longitudinal direction of the container.

In some cases it may be preferable to fill up the inner space of the liner 2 during the first extruding stroke with a molten material which has a higher fusing point or is harder than the material to be later regularly extruded; i. e., for instance, a molten phosphor bronze may be poured for the first time into said space, whereas, for instance, molten purest aluminum is filled later into said space regularly. There then remains in the tubular zone for the reception of the above-mentioned layer 9 a protective layer consisting of phosphorus bronze.

The zone according to Fig. 1 for the reception of the protective layer 9 may also be subdivided into various, for instance, into two tubular zones arranged concentrically with respect to one another, one of which is filled up with a material having a higher fusion point than the material to be extruded and the other is filled with a material consisting of the material to be extruded. A corresponding form of the invention is shown in Fig. 2.

Within the enlarged bore 11 (Fig. 2) of the steel liner 2 is provided an outer tubular zone which is filled up with a molten material 12 having a relatively high fusing point, such as, for instance, gun-bronze. Furthermore, a lining 13 which consists of the same material as the material to be extruded, for instance, purest aluminum is provided in an inner tubular zone facing the extrusion die 4. In this case the two tubular protective layers 12 and 13 serve to protect the material of the liner 2 from being destroyed by the molten material to be extruded.

In the embodiment shown in Fig. 2 the enlarged bore 11 of the liner 2 is provided at the upper and lower end of the container 1 with two pressure-tight bushes 14 and 15 whose diameters are, for instance, only 1 mm. greater than the diameter of the extrusion die head 3.

In the container shown in Fig. 3 circular dove-tailed grooves 16 are turned in the steel liner 2 so that also dove-tailed projections are formed. The above-mentioned enlarged bore is formed by the front faces 18 and 19 of the grooves 16 and of the projections 17 respectively and by the undercut surfaces of these depressions and projections. The projections 17 are shaped in such a manner that the front faces 19 of these projections are spaced a certain distance from the path in which moves the jacket surface of the die head 3. In this manner a tubular space is obtained between said path and the front faces 19 which space may serve to form the protective layer to be hereinafter described and which has a similar function as the zone for the reception of the protective layer 9 according to Fig. 1.

The restricted portions of the bore of the liner 2 shown in Fig. 3 are provided at the upper and

lower end of the container with small depressions 21 having also a dove-tail shape. Dove-tail shaped projections 22 are formed by the depressions 21.

The tubular zone between the front faces 19 (Fig. 3) of the projections 17 and the path of the jacket surface of the die head 3 is filled up with a material 20, for instance, with a hard aluminum alloy serving as protective layer. This material also fills up the comb-like depressions 16. The projections 17 are therefore completely surrounded by said protective layer. Also the depressions 21 at the upper and lower end of the container are filled up with the above-mentioned hard aluminum alloy.

The protective layer which consists of the material 20 contained in the above-mentioned tubular zone and of the material in the depressions 16 protects the material of the steel liner 2 against destructions which might be caused by the molten material to be extruded. By the passage of the material forming the protective layer into the depressions 16, 21 the wandering of the protective layer in the axial direction of the container is prevented to a greater extent than is the case with the forms shown in Figs. 1 and 2. Owing to the dove-tail shape of the depressions 16, 21 also a squeezing out of the lining material in the radial direction to the axis of the container is prevented.

The container shown in Fig. 4 is designed in part similar to that shown in Fig. 3. However, in the form of the invention according to Fig. 4 a relatively thin walled, pressure-tight and corrosion-proof metal bush, for instance a bush 23 made of steel bronze is arranged in the immediate neighborhood of the path in which the jacket surface of the die-head 3 moves in the steel liner 2. A portion of the length of the outer surface of the bush 23 is surrounded by a tubular recess serving for the reception of a protective layer 24 and which has the same function as the tubular zone for the reception of the protective layer 20 in Fig. 3. Adjacent to the tubular space for the reception of the protective layer 24 (Fig. 4) are disposed comb-like depressions 25 which have the same function as the depressions 16 shown in Fig. 3 and which are formed in the same manner as these depressions by annular dove-tailed grooves. The above-mentioned enlarged bore of the liner 2 is formed in the embodiment shown in Fig. 4 in the same manner as in the embodiment shown in Fig. 3 by front faces 36 and 37 and by the undercut surfaces of the depressions 25 and of the projections 38 placed therebetween.

The bush 23 (Fig. 4) is provided with perforations 26 through which passes the molten material to be extruded, for instance, purest aluminum when pouring this material into the container and when exerting a pressure by means of the extrusion die 3, 4. Owing to the arrangement of the perforations 26 the pressures exerted on the material to be extruded interiorly and exteriorly of the bush 23 are equalized so that a non-uniform stressing of this bush is prevented. The thin-walled bush 23 may be exchanged, because of the tearing of metal of the bush without there occurring a considerable loss of material.

If necessary, the bush 23 (Fig. 4) may have such a large inner and outer diameter that the outer jacket surface of the bush is not only in engagement with a protective layer 24 but that also a similar protective layer is arranged between the bush 23 and the path formed by the jacket sur-

face of the die head 3. A bush arranged between two protective layers is shown in Fig. 5.

In the form of the invention shown in Fig. 5 a bush 28 which consists of a ceramic material containing, for instance, steatite which cannot be corroded by the material to be extruded such as, for instance, purest aluminum or of a corundum mixture is arranged in the enlarged bore 27 of the steel liner 2. The bush 28 has such an outer and inner diameter that it is spaced a given distance both from the enlarged bore 27 and from the path in which moves the jacket surface of the die head 3. In this manner tubular zones are formed exteriorly and interiorly of the ceramic bush 28 serving for the reception of the protective layers 29 and 30 respectively. A material similar to the material to be extruded, such as, for instance, purest aluminum may be employed also in these zones as a protective layer. The bush 28 is provided with perforations 31 which have the same function as the perforations 26

shown in Fig. 4. An equalization of the difference in pressure between the outer layer 29 and the inner layer 30 may be brought about with the aid of the perforations 31. Consequently, the outer and inner jacket surfaces of the ceramic bush 28 are embedded in a molten material such as, for instance, purest aluminum which is under a uniform pressure and cannot therefore be destroyed by the pressure brought about during the extruding stroke although it is in itself fragile.

At the lower end of the container is provided as shown in Fig. 5 an annular closure 32 designed in the form of a nut which is threadedly associated with the steel liner 2 and by means of which the ceramic bush 28 and the metallic lining 29 which is solidified after the first charging and which is arranged exteriorly of the bush are protected in the liner 2.

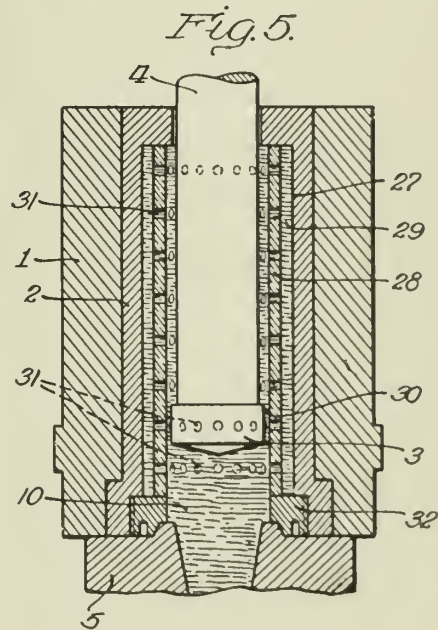
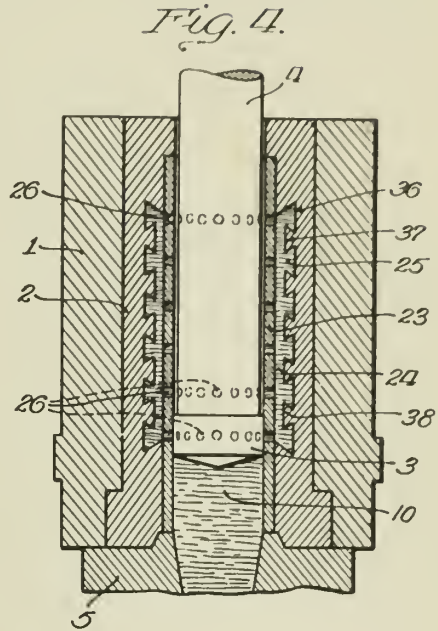
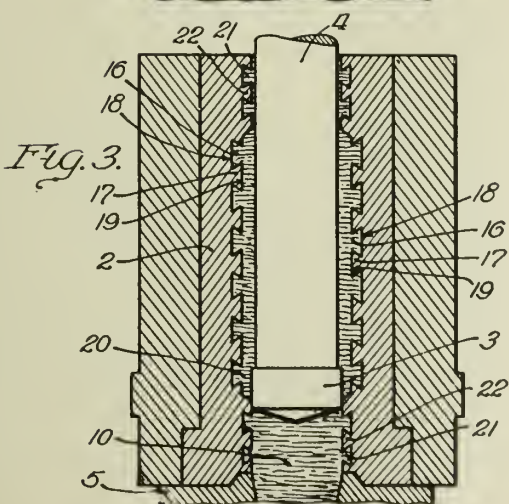
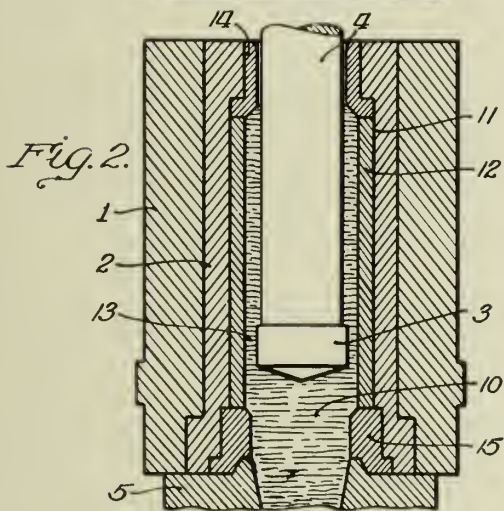
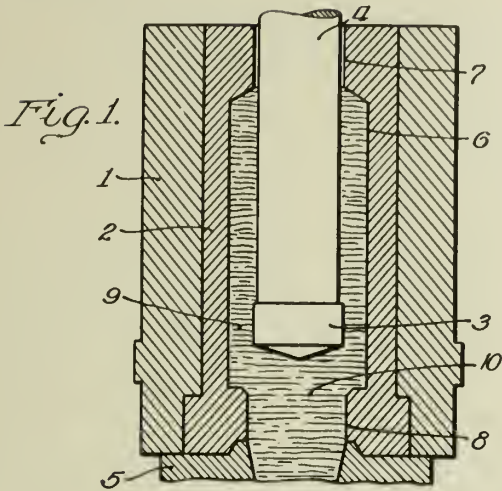
FERDINAND HANFF.

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# ALIEN PROPERTY CUSTODIAN

## ELECTROLYTIC CELLS

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Application filed October 25, 1940

The present invention relates to electrolytic cells commonly used for the electrolysis of alkali chlorides and other similar solutions, and in particular to an arrangement for reducing in a substantial extent the obstruction which occurs in the porous diaphragms used in these cells.

It is well known how in these cells, for the fact that the brines used are not very pure, and as some grains or particles of graphite are easily detached from the graphite electrodes forming the anodes, the porous diaphragms in contact with the metal electrodes forming the cathodes are easily obstructed by such solid particles. These obstructions rapidly reduce the efficiency of the cell, so as frequent washing of the said diaphragms are required in order to eliminate the above mentioned particles. For washing said diaphragms it is necessary however to stop the normal operation of the cell at least for a period of 24 hours, and this is another considerable difficulty experienced in the operation of said cells.

The main object of my invention is to eliminate the mentioned difficulties and to provide a cell, which may operate for a long time-period with a good efficiency and without requiring washing.

Another object of this invention is to provide a cell provided with one or more supplementary diaphragms located between the graphite-anodes and the porous covering of the cathodes.

Such a supplementary diaphragm retains most of the graphite-grains, which leave the anodes, without preventing the free circulation of the electrolyte in the cell.

Another object of this invention is to obtain a better operation of the graphite-anodes, providing for an electric connection between the particles deposited on the diaphragms and the anodes so as to cause said particles to work as anodes in the electrolytic process. The electrolysis which occurs near said diaphragms through the action of these particles, causes a development of gas on the whole surface of the diaphragms and the impurities deposited on them are continuously eliminated by means of the developed gas-bubbles, so that the obstruction of diaphragms results considerably hindered.

The accompanying drawing is a sectional elevation of an electrolytic cell according to the invention, where a single anode and a single cathode are shown.

In the illustrated embodiment of the invention, the cell comprises a metallic casing 5 with discharge tubes 6 and a graphite-electrode 1 con-

neeted with the positive pole of the electric source so as to work as anode.

The cathode 2 is constituted with a perforated sheet iron, covered in the usual manner with the diaphragm 3 formed with textile-fabric or asbestos-board. According to the invention the anode is encircled with an envelope of asbestos-labrie 4.

The spaces A<sub>1</sub>, A<sub>2</sub> and A<sub>3</sub> constitute the anodic room containing the brine as electrolyte.

Heretofore in such a cell, the level *a* of the fluid in the anodic room was maintained at a constant height, while in the cathodic room the level *k* was lowered changing the position of the outlets of the discharge pipes according to the progress of the obstruction on the diaphragms. When said obstruction had reached a predetermined limit, the level *k* could not be still lowered and the stopping of the operation of the cell was necessary for washing or changing the diaphragms. Furthermore, as the obstruction of said diaphragms is not quite uniform, a non-uniform passage of the liquid through there results.

According to the present invention, the participation of said graphite-particles to the electrolysis with the consequent production of gas-bubbles reduces the possibility to excessively increase the depth of the graphite-layer and due to the said gas-development, on the whole surface of diaphragms, a uniform filtration is obtained.

This gas-development on the diaphragms-surface is assured as follows: the chlorine developed in the rooms A<sub>1</sub> and A<sub>3</sub> and having a slight overpressure, passes through the pores of the envelope 4 and through the openings *d* provided in it and pushes the envelope 4 near the diaphragm 3.

Through the fine graphite-particles indicated on the drawing with 7 and deposited on the inner-surface of the envelope 4, and through the graphite-particles indicated with 8 and obstructing some pores of said envelope, the electric current passes from the anode 1 to the layer 9 of graphite-particles deposited on the diaphragm 3, so as said layer may work as anode and decompose the electrolyte, producing the above mentioned gas-bubbles on the diaphragm-surfaces.

The passage of the electric current from the anode 1 to the graphite-layer 7 is obtained as follows:

The specific gravity of the fluid in the room A<sub>3</sub> during the operation of the cell, is ever higher than the specific gravity of the fluid contained in the room A<sub>2</sub>, due to the gas-bubbles produced

in said room A<sub>2</sub>. In consequence of said specific gravity difference, a liquid flow from the lower room A<sub>3</sub> to the upper room A<sub>2</sub>, is established. This flow of the liquid is also aided by the gas-bubbles flowing upwards, and by the openings *e* provided in the lower portion of the envelope 4. The above described flow of the anodic liquid convey the graphite-grains which leave the anode into the room C between said electrode and the envelope 4 forming in this manner an electric connection between them.

The electric connection between the anode and the diaphragm may also be obtained by means of conducting pieces located between the anode and the graphite layer deposited on the said envelope. Said conducting pieces are formed in the embodiment known as projections *z* provided on the graphite-electrode 2.

The graphite-particles leaving the anode represent commonly a loss of material. On the contrary according to the process that is the object of my invention most of the said graphite-particles are not lost because they remain in electric contact with the anode and still form a part of the anode.

An identical operation of the cell may be obtained, according to my invention, also without the intermediate diaphragm 4, and providing direct electrical connection, between the anode and the graphite-particles which are gathered on the diaphragms of the cathodes. Said electric conducting connections may be located either outside or inside the cell.

BELA FELEDI.

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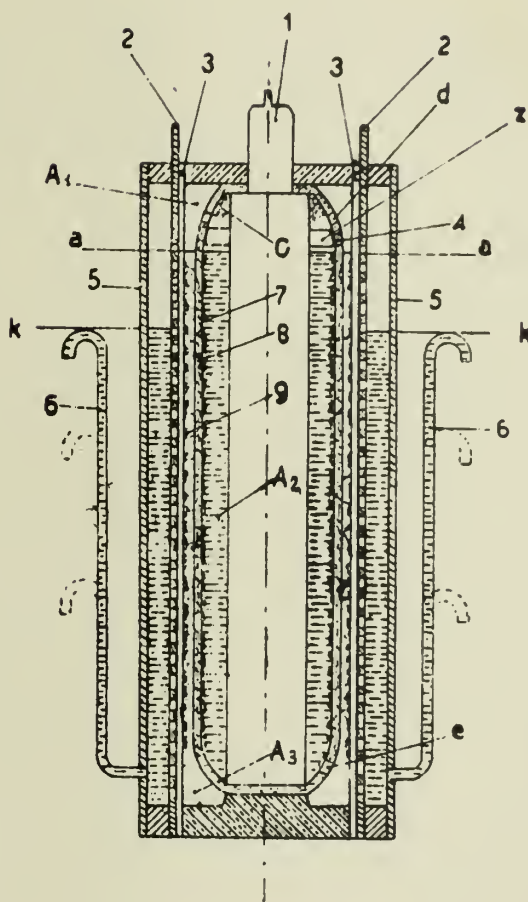
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ELECTROLYTIC CELLS

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by his attorney  
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# ALIEN PROPERTY CUSTODIAN

## ELECTROLYTIC CONDENSERS

Akira Miyata, Tokyo, Japan; vested in the Alien  
Property Custodian

Application filed October 25, 1940

My invention relates to electrolytic condensers and the method of forming the same by utilizing the porous oxide film structure which is produced on such metals, as aluminum, when it is made anode in an electrolyte, by impregnating this structure with another suitable electrolyte in paste form.

This application is in part a continuation of my copending application, filed at the same time, which describes a novel method of making an electrolytic condenser, of low power factor, small leakage, cool operation, small size and longer life.

The utilization of aluminum sheet or foil, having on its surface an oxide film and an active layer, or an inactive layer and a dielectric layer, covered with an impregnated fabric or paper electrolyte has long been known in the arts.

The object of my invention is to provide a condenser suitable for continuous service on either an A C or D C current, but especially for use on an A C line, without heating or deteriorating, and possessing self repairing properties.

Another object of my invention is to utilize the oxide film which is formed in such a manner as to enable its structure (like a sponge) to hold a suitable electrolyte, eliminating the impregnated fabric or paper, plastic or fillers, thereby dissipating the heat more quickly and evenly, thus reducing the power factor to as low as .5% compared with 1.5-3% of ordinary condensers.

Another object of my invention is to utilize the oxide film structure as a carrier or spacer for the electrolyte, between the electrodes, eliminating the aforesaid impregnated paper or fabric, etc., whereby reducing the size of the condenser from one third to one tenth the size of the ordinary type of the same capacity, which is most desired in modern applications, such as electrical appliances, switches, etc.

Another object of my invention is to provide a means for the support and cover of the electrolyte which will not dry out nor deteriorate with age.

Other objects will be apparent as the invention is described:

Figure 1 on the accompanying drawing, shows a diagrammatical highly magnified cross section of an anodic sheet.

Fig. 2 shows the diagrammatical, highly magnified cross section after the annealing or heat treatment.

Fig. 3 shows the diagrammatical, highly magnified cross section after the film is impregnated with an electrolyte and then covered with an

aluminum foil or tin foil so as to act as a cushion or seal.

Fig. 4 shows the wiring method for an A C condenser.

Fig. 5 shows the wiring method for a D C condenser.

Referring to Fig. 1. The aluminum sheet or foil 1 is treated in an acid solution so as to produce the porous oxide film 2 containing the coated pores 3 and the active layer 4 which is unstable. In order to understand this formation clearly, a detailed description will be given. It has long been understood in the arts, that if aluminum is made anode in an electrolyte of weak acid solutions such as sulphuric, chromic, phosphoric, etc., and a current applied, an oxide of the metal will form on the surface. Heretofore, any type of acid was used to form this oxide film as the results were thought to be the same, but my invention pertains to the use of such acids as oxalic, etc., which does not leave a residue of the acid, which is conductive and destructive, after the aluminum is heated. It must be realized that the pores which I have diagrammatically illustrated are microscopic and the electrolyte absorbed into these pores, during the anodizing can not be eliminated by washing, which has always been the practice. The electrolyte or its harmful radicals in the form of residues remaining in the pores continue to react and destroy the active layer, thus creating a large leakage which shortens its life. It is my purpose to enlarge these pores to their maximum, eliminating the soft coating on the side walls of these pores 3 and thereby evaporating or removing the entrapped electrolyte by using such acids as oxalic, which will not leave a reacting residue, when the aluminum is heated to completely remove the moisture. This soft coating, probably  $(\text{HO})_2\text{Al}$  will then change and harden to  $\text{Al}_2\text{O}_3$  which forms the inactive layer. When these pores are enlarged by heat treatment, the walls straighten and stiffen due to the shrinking action, and the moisture driven off, they will then accommodate a sufficient amount of electrolytic paste which is essential for condensers, thereby eliminating other absorbent materials such as paper, fabric, etc.

The type of acid should be similar to oxalic, because the minute traces of the acid which remains in the pores, even after repeated washings can be destroyed with the application of heat. This reaction can be shown as follows:



Or oxalic acid with the application of heat sublimates and decomposes into formic acid ( $\text{HCOOH}$ ) and carbonic anhydrid ( $\text{CO}_2$ ) which evaporates.

After the oxide film 7 is formed to the desired thickness in an oxalic acid solution, it is washed several times with clear water and wiped dry. The aluminum sheet 5 is then heated to approximately 500 degrees Cent. for several hours. These figures are only used as an illustration and should not be taken as a strict limitation. The soft coating 6 of the oxide which more or less clog the pores shrink considerably becoming hard and forming a palisade. Hence there is an appreciable enlarging of the pores, and the oxalic acid which could not be washed out is now sublimated and decomposed. This is illustrated in Fig. 2, by 8.

When aluminum is oxidized in an oxalic solution an active layer 7 is formed on the surface. This active layer crumbles and becomes the oxide film as long the current passes and this procedure is a continuous one, but when the oxide film becomes quite thick, the underlying layer becomes stable.

After the pores 10 in the aluminum sheet 9 are enlarged and hardened, the active layer is once more produced and subsequently hardened as in Fig. 3 by 11. As the pores are now at their maximum, they are ready for impregnation of an electrolyte in paste form as is shown in Fig. 3

by 12. The electrolyte comes in direct contact with the active layer 11, and will repair any injury which might be caused internally or externally.

Aluminum or tin foil sheet 13 is placed over this coating of electrolyte, sealing the surface and also acting as a cushion. Thus it can be seen that the condenser as a whole can dissipate any internal heat which may form, as the aluminum, the oxide film, and the foil are good conductors of heat, and will diffuse the heat more efficiently than the ordinary condensers made with fabric or paper, compounds or fillers, between the electrodes. It is quite obvious that the omission of these bulky non-heat conducting materials will appreciably cut down the size as well as increase its efficiency.

Fig. 4 illustrates an arrangement of the anode and cathode plates of a condenser, 18 and 19 of an A. C. condenser, and the aluminum or tin foil sheets 15 between them only acting as a cushion and a seal for the electrolyte.

Fig. 5 illustrates an arrangement of the anode and cathode plates of a condenser, 20 and 23, for a D. C. condenser, where the aluminum sheet 20 having an impregnated surface 22, are separated by aluminum or tin foil which not only acts as a cushion and seal for the electrolyte of the oxide film but is used as one of the electrodes.

AKIRA MIYATA.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

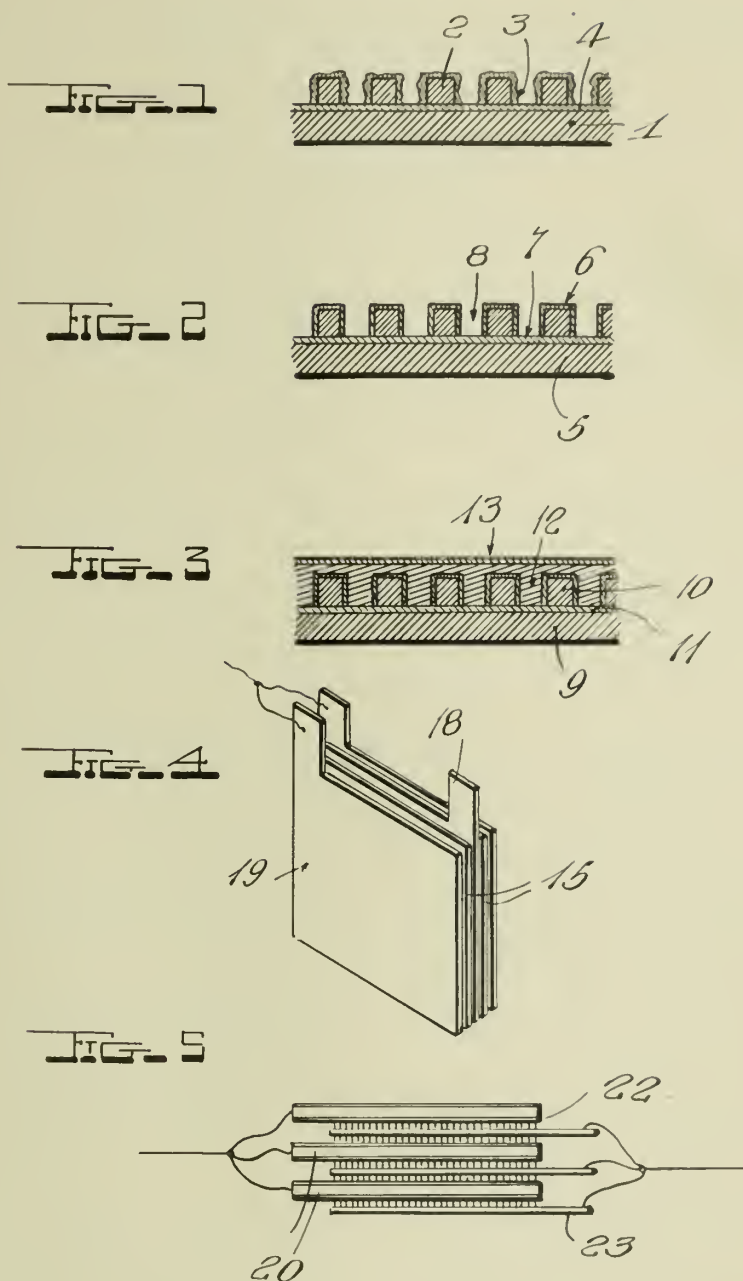
A. MIYATA

ELECTROLYTIC CONDENSERS

Filed Oct. 25, 1940

Serial No.

362,878



INVENTOR.  
AKIRA MIYATA,  
BY  
Donald L. Mayson,  
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# ALIEN PROPERTY CUSTODIAN

## METHOD OF MAKING ELECTROLYTIC CONDENSERS

Akira Miyata, Tokyo, Japan; vested in the Alien Property Custodian

No Drawing. Application filed October 25, 1940

My invention relates to an improved and novel way to prepare an electrolytic condenser by first forming a suitable porous oxide film structure on aluminum, by enlarging the pores of the oxide film with a heat or annealing treatment, by forming the active layer under this oxide film, by annealing this active layer with heat, by covering the edges and corners with a suitable insulating lacquer, by repairing this active layer if necessary, if it was injured by the heat treatment, by impregnating the oxide film with a suitable electrolyte, by covering the said impregnated surface with tin or aluminum foil, and finally aging the said electrodes.

This application is in part a continuation of my copending application filed at the same time, which utilizes the pores of the oxide film as a spongy structure, to hold a suitable electrolyte for an electrolytic condenser.

An object of my invention is to provide a method of forming an electrolytic condenser suitable for continuous service or operation on either an A. C. or D. C. current, which will not heat thereby causing destruction, as is common with the present day condensers.

Another object of my invention is to provide a method of forming an electrolytic condenser of exceptionally large capacitance, but of small size, with low power factor, small leakage, and long life.

Another object of my invention is to provide a method of prolonging its self-life by stabilizing the oxide film in electrolytic condensers.

Another object of my invention is to provide a method of forming the active layer, stabilizing it, and then if necessary repairing it.

Other novel features will be apparent as the invention is described:

### Process

The aluminum which is to be oxidized, if hard, is first treated to an annealing process, to relieve any strain in the material as well as to make the surface easy to oxidize.

The aluminum sheet is then made anodic in an electrolytic solution of 3-10% oxalic acid, at room temperature, but less than 25 degree Cent. and with a D. C. of 30-50 volts, which assumes a current density of from 5-25 mA/cm<sup>2</sup>, for a period of about one hour, or until the film becomes 20-30u in thickness.

(a) The oxidized aluminum is washed several times in clear water to remove the excess electrolyte, wiped dry and then subjected to a strong annealing treatment of from 300-500 degree

Cent. for a period of several hours. This change in temperature sublimates the acid remaining in the pores, which is entrapped, into formic acid (HCOOH) which is dispersed, and carbonic anhydride which evaporates. This procedure eliminates completely, the harmful acid radicals or residues which helps to destroy the active layer and would thereby cause current leakage and large power loss.

(b) At the same time, the soft voluminous coating on the pores in the form of aluminum hydroxide (HO)<sub>3</sub>Al, probably loses its water and changes to aluminum oxide or Al<sub>2</sub>O<sub>3</sub>. When this occurs, this soft coating shrinks and tightens, and the inside wall of the pores straighten thereby enlarging the pores and corrects the clog-up tendency. These enlarged pores of the oxide film are necessary to accommodate the electrolyte.

(c) When these pores are enlarged to their maximum and impregnated with a suitable electrolyte, the series resistance is reduced and thereby assuring cooler operation.

4. The active layer is then correctly recreated.

This term is used because the underlying layer of aluminum just beneath a formed oxide film is always present as it is the mother of the film. This crumbles as the formation process is carried out and becomes the oxide film. As this action

is a continuous one, the oxide film gets gradually thicker and has a tendency of stabilizing the active layer. Now when the pores of the oxide film of a desired thickness are enlarged, this gives access to the active layer which then can be adequately formed in another electrolyte to the desired capacitance. Hence an ammonium borate solution or a neutral boric acid and ammonium hydroxide solution of 2-3%, or other suitable electrolyte is used at room temperature.

at a D. C. voltage corresponding to the desired capacitance required such as from 100-1000 volts for a period of 5-6 hours.

5. The aluminum is again reheated for several hours at a temperature of from 300-500 degree Cent. to again anneal the aluminum by relieving any strain on it and to shrink the superimposed oxide film layer as much as possible.

6. Due to the difference in expansion of the aluminum, the oxide film, and the active layer, there may be a tendency for the active layer to crack. This would cause a current leakage so the active layer is again repaired by repeating the process of recreating the active layer, and this painstaking method of reforming and recreating this active layer, safeguards it from

further cracking, or leaking. This process can be eliminated if no cracking occurred.

7. Since the edges and the corners of the aluminum oxidizes ununiformally, there may be flaws or cracks, and consequently the pores are not uniform in direction or size, and the active layer is unprotected. Therefore a suitable lacquer is applied around the edges. This lacquer will not peel off because it penetrates into the pores, and rootlike fastens itself to the aluminum.

8. The aluminum, thus prepared is wiped dry and impregnated with a suitable electrolyte such as ammonium borate and glycerin by simply

brushing the surface, and the oxide film with its enlarged pores, will absorb a sufficient quantity.

9. A layer of tin foil or aluminum foil is placed over this impregnated surface keeping the air away from the electrolyte to preserve it, and to keep excess moisture from being absorbed by the electrolyte. At the same time, it acts as a cushion to prevent it from injury. In the D. C. condensers, this layer of foil acts as one of the electrodes as well as the cushion and covering material.

AKIRA MIYATA.

# ALIEN PROPERTY CUSTODIAN

## CENTRIFUGAL COUPLINGS

Elmar Wittkop, Sprockhovel, Germany; vested in  
the Alien Property Custodian

Application filed October 25, 1940

My invention relates to a centrifugal coupling equipped with hollow cylinders constituting the centrifugal bodies which are arranged and combined with certain other members in such a manner that certain drawbacks from which the known centrifugal couplings suffer are obviated. This is effected by arranging said hollow cylinders which are subjected to the action of adjustable springs acting counter to the centrifugal force, in such a manner, that they are axially radially shiftable and that their outer frontal surface is so designed as to form a pressure-transmitting surface able to transmit the turning moment. It is very well possible to design this arrangement and combination of parts in such a manner that besides the said hollow cylinders separate bodies connected with them and being movable to all sides are used whereby it is rendered possible to give the said cylinders and, thus, also the pistons a particularly great length, as well as a particularly large diameter, which entails the useful effect that comparatively great turning moments can be transmitted in spite of the bulk of the coupling being exceedingly small. Owing to the provision of said springs which act counter to the centrifugal force it is rendered possible to exert an influence upon the temporal course of the coupling procedure by giving the springs a higher or lower preliminary tension. Finally, owing to the pressure-transmitting surfaces being movable, the possibility is afforded to accommodate the coupling largely to irregularities, and first of all it is warranted that all hollow cylinders contribute equally to the transmission of the performance.

The invention is illustrated diagrammatically and by way of example on the accompanying drawing on which Figure 1 is a side-view of a centrifugal coupling designed according to this invention, the upper half of the figure being drawn as an axial middle section, whereas Figure 2 is a frontal view, likewise partly in section.

Referring to these Figs., 1 denotes the motor shaft to which is keyed the hub 2 that is provided with three cavities arranged in star-like manner and containing each a cylinder 3. These cylinders form in their entirety the one part of the centrifugal bodies of the coupling, whereas the other part is formed by pistons 4 arranged in said cylinders. Both parts are radially movable independently from one another so that when the respective machine or engine is starting they tend to travel outwardly. This tendency is, however, counteracted by several forces, viz: the cylinders 3 are continually subjected to the action of springs 5 which may be given, with the aid of the nuts 6, the preliminary tension requisite in every case. This tension is so chosen that the cylinders remain in equilibrium when the machine or engine is starting. With the pistons 4 it is the damping material (oil or the like) filling the cylinders and counteracting the free outwardly

directed movement of the pistons 4. In order to provide for the shifting of the pistons taking place with such reduced speed as is desired at the time being, the sectional area of the throttling passages through which the braking mediums must be pressed is appropriately chosen. There is, for this purpose, either every piston provided with a plurality of fine longitudinal bores or a certain narrow gap is left between the oppositely located surfaces of every piston and the appertaining cylinder, as is shown in the Figs. By arranging a non-return valve in a channel of the piston 4 it is in every case possible to provide for the pistons moving outwardly with the desired slow speed, but moving inwardly with the desired increased speed as the sectional area through which the oil etc. is to pass is suitably large. Comparatively weak springs 7 hold the pistons when they are in their position of rest always in their inner end position. The cylinders 9 are provided at their outer ends with segments 8 bearing a suitable friction covering 9 and serving to take along with them the coupling bodies connected with the shaft 10 to be driven. Said segments are not rigidly connected with the cylinders but are movable to all sides so as to be able to contact with them on their entire surface. The body effecting the connection with said shaft is designed as a ring 11 turnably supported on the hub 2 and contacting with the sliding bearings 12, and surrounding the cylinders 3, or their segments respectively, in a certain distance thereof.

When the motor has been started it attains its full number of revolutions, say 1500 per minute, in a very short time. The cylinders 3 and the pistons 4, which both are radially movable on the hub 2 are, therefore, practically at once subjected to the action of the centrifugal force which tends to fling them outwardly. While the cylinders 3 are at first kept in equilibrium by means of the springs 5, the pistons 4 can slowly travel outwardly and press the braking medium to their rear side through the throttling passages. The pressure exerted during that time upon the outer surface of the cylinders 3 by the intermediary of the braking medium causes the cylinders likewise to move outwardly until they contact with the segments 8. There arises at first a certain sliding friction whereby, however, while the operation is going on, the ring 11 and thus also the shaft 10 are being taken along with by the segments, in consequence whereof finally the entire performance is transmitted. This comparatively short delay during the coupling procedure is sufficient to obviate such knock-like strains as have hitherto been experienced with the known centrifugal couplings whereby also the detrimental premature destruction of the machine or engine parts concerned is obviated.

ELMAR WITTKOP.



PUBLISHED

MAY 18, 1943.

BY A. P. C.

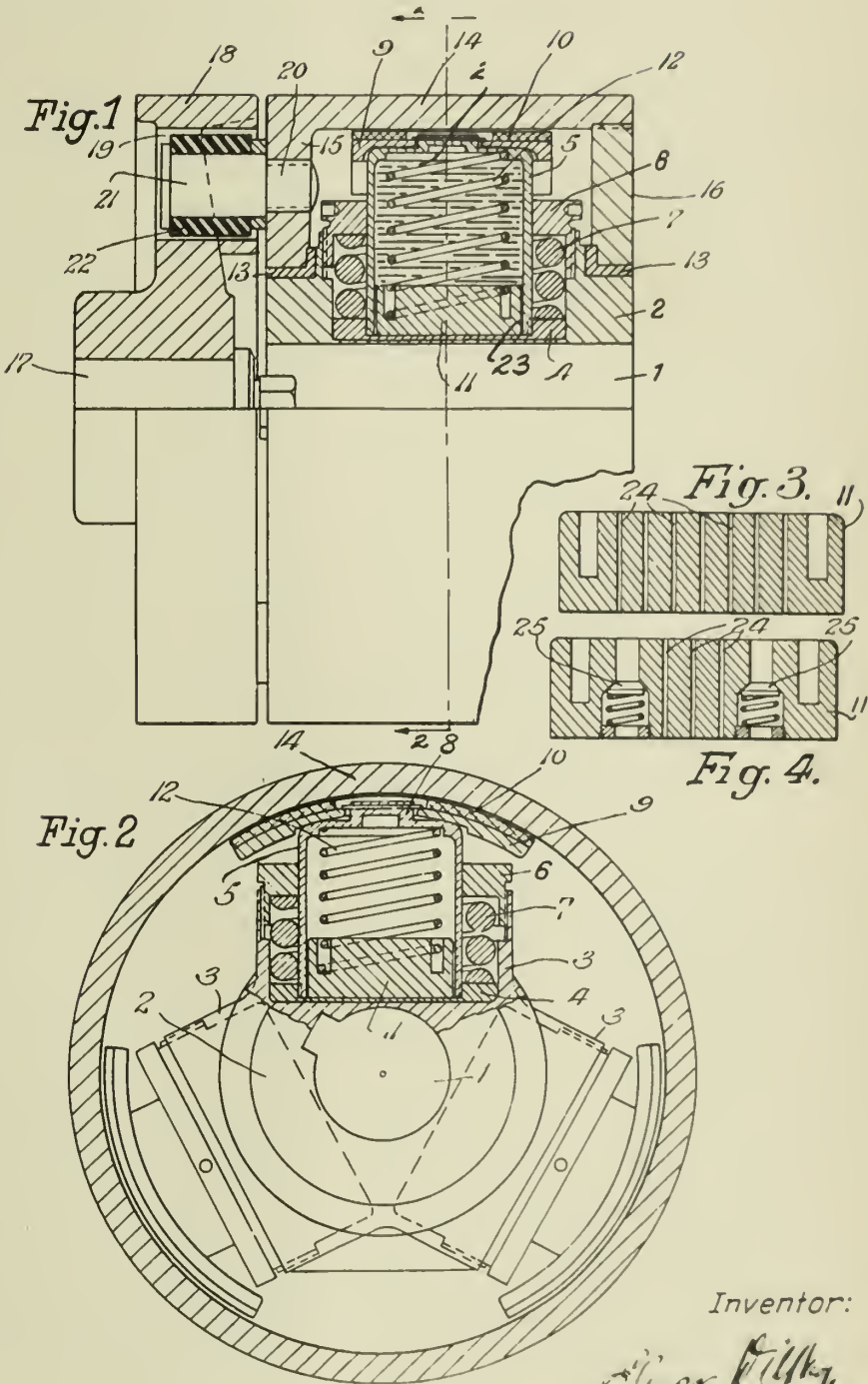
E. WITTKOP

CENTRIFUGAL COUPLINGS

Filed Oct. 25, 1940

Serial No.

362,883



Inventor:

*E. Wittkop*



ALIEN PROPERTY CUSTODIAN

AIRCRAFT PROPULSION

Max Lorenzen, Dessau, Germany; vested in the  
Alien Property Custodian

Application filed October 28, 1940

It is known to have adjustable propellers for aircraft and the like and to control the adjustment in accordance with the engine speed. United States Patent No. 2,205,625, for example, discloses an arrangement for speed regulated adjustable propellers in which the adjusting device of the speed regulator is coupled with the device employed for varying the fuel feed of the engine in such manner and through means whereby every adjusting movement of the fuel feed varying device effects an alteration in the nominal speed adjustment of the regulator. The arrangement described in that patent, moreover, provides an adjusting member which permits the making of facultative supplementary alternations in the nominal speed of the regulator but no alteration of the fuel feed. A particular embodiment of this arrangement includes an additional adjusting member by means of which the speed regulator can be rendered inoperative and the propeller blades set for gliding or even at a braking position.

The present invention relates to a further development of this arrangement. Specifically, it provides means for rendering the speed regulator inoperative and for controlling the means for setting the propeller blade pitch so that the propeller blades will be set at rigidly defined limit positions when the nominal speed adjustment of the regulator (which adjustment is effected by the fuel feed varying means) exceeds predetermined lower or upper limits. As in the patented arrangement described above, the nominal speed adjustment may, if desired, be supplementarily produced.

In the arrangement to be specifically shown and described herein, governor means effects the change of position of a valve in a hydraulic system and consequently through the valve causes fluid pressure to be directed to one end or the other of a piston. Movement of the piston is used to effect changes in pitch of the propeller blades. The governor means is spring tensioned and the spring tension may be varied by means associated with the throttle lever (and with a supplementary adjusting lever) so that a nominal engine speed can be maintained by the governor.

The arrangement, however, is such that, assuming the craft has been cruising with a nominal engine speed, and it is desired to land, movement of the throttle lever to a position effecting actuation of the throttle lever to idling position will vary the spring tension of the governor means and, consequently, through the hydraulic system mentioned, change the pitch of the propeller blades to the proper idling position. Moreover, further movement of the throttle lever in the same direction will not affect the throttle valve, but through appropriate mechanism will directly control the hydraulic system, irrespec-

tive of the governor means, whereby the pitch of the propeller blades can be changed still further to zero or even to braking position.

Conversely, assuming again that the craft is cruising at the nominal engine speed and has been maintained at such speed by the governor means, and it is now desired to open the throttle valve to maximum, actuation of the throttle lever will accomplish this, and by varying the spring tension of the governor means will consequently change the propeller blade pitch. Moreover, when the throttle valve has reached maximum position, further movement of the throttle lever in the same direction will now, through means to be described, directly control the hydraulic system, irrespective of the governor means, whereby the pitch of the propeller blades can be still further changed.

The principal object of the invention is to provide such an arrangement.

The invention also has for an object the provision of such an arrangement which is simple and accurate in operation.

Other objects of the invention shall be apparent from the following specific description of the arrangement which is illustrated in the accompanying drawings in which:

Fig. 1 is a diagrammatic view of the invention.

Fig. 2 is a special embodiment of the throttle lever system.

As shown in Fig. 1, upon the propeller shaft 2 there is disposed a hub 4 with hub sleeves 6 in each of which a propeller blade 8 is rotatably journaled about its longitudinal axis. The propeller blades carry lever arms 10 which, through agency of link 12 and a rod 14 are attached to an operating piston 16 displaceable in cylinder 18. A slide valve 20 serves to regulate the inlet and outlet of fluid (supplied under pressure by pump 22) to and from the operating cylinder, and consequently serves to effect displacement of the operating piston and hence through members 10, 12 and 14 to effect a change in the pitch setting of the propeller blade 8.

A pressure pipe 24 leads from the pump 22 to the central chamber of the slide valve housing 26. From the end chambers thereof, pipes 28 and 30 lead back to the pump. A spring-loaded safety valve 32 is incorporated between the pressure pipe and the return pipe. The slide valve housing and the operating cylinder are connected together by means of the passages 34 and 36 which are controlled by the slide valve 20.

Movement of slide valve 20 is effected by means of the centrifugal regulator or governor which rotates with the propeller. This regulator serves to engage the sleeve 38 mounted on the rod 40 of the slide valve 20. The regulator can be set for various regulated speeds.

The centrifugal regulator or governor consists

of the centrifugally responsive weights 42 disposed on the bell-cranks 44 and of a spring 46 which serves to oppose the centrifugal force. The spring abuts at one end against the sleeve 38 engaged by bell-cranks 44, and at the other hand against a movable abutment or support 47.

A lever 48 serves to move the abutment or support 47 to compress the spring 46. One end point of the lever 48 is attached as at 49 to the bearing block 50 which is rigidly associated with the propeller hub 4 through agency of the shaft extension 52, whereas the end of a rod 54 engages with the other end 56 of the lever 48. The other end of rod 54 is connected with the lever 58. The lever 58 is pivotally journaled at 60, said pivot point rotating along with the propeller, and at the other end the lever 58 is connected through pivot 62 with the carrier collar 64 which is rotatably mounted in an annular groove of an axially displaceable slide member 65 which surrounds the bearing 68 of the propeller shaft 2. The displacement of the slide member 65 is effected by means of a rod 68 journaled on the aircraft (for example in a bearing 70), the rod 68 being attached to a double-armed lever 72, the two ends 74 and 76 of which are respectively connected with the pivoted adjusting members 78 and 80. The member 80 is the fuel throttle lever, and the member 78 is a supplementary adjustment lever, the purpose of which will be later described.

The adjustment members 78 and 80 carry resiliently pivoted teeth or pawls 82 and 84 which engage in suitable notches on exposed racks 86 and 88 so that the members 78 and 80 will be automatically retained in any of the positions to which they may be moved. The throttle lever member 80, attached to the end point 76 of lever 72, is likewise associated by means of rod 92 with the member that regulates the fuel feed of the engine, that is, it is, for example, connected with a butterfly valve 94 which is disposed in the pipe 96 leading from the carburetor 98 to the engine.

The slide valve rod 40 which carries the regulating sleeve 38 carries an extension 100 which carries an abutment 102, said extension passing through the abutment 47 aforesaid and extending out beyond lever 48. An abutment stop 104, moreover, is disposed on the extension rod 100 on the side opposite the abutment 47.

The operation of the arrangement is as follows:

The adjusting movement of the fuel throttle lever 80 is transmitted through agency of rods 92, 68, and the lever 58, pivotable about pivot point 60 (and which rotates with the propeller) through rods 54 and 48 to the abutment 47 against which bears the spring 46 of the centrifugal regulator or governor. When the throttle lever 80 is moved so as to increase the engine output by moving in the direction of the arrow, the abutment 47 will serve to compress spring 46 to a certain amount so that the nominal speed maintained by the regulator will be increased. Moving the throttle lever 80 in the reverse direction serves to decompress the spring 46.

The lever 78 may be used to effect a supplementary adjustment of the nominal speed of the regulator, using the same operative members. If the lever 48 is advanced against the abutment 102 the centrifugal regulator will be cut out and the control valve 20 will be moved to its right hand terminal position. This serves to connect

the pressure pipe 24 with passage 36 so that the operating piston 16 will be urged from the right and to its left hand terminal position. The propeller blade 8 will thereby be set to a large pitch. This position of the propeller blade 8, which is preferably limited by abutment stops (not shown), may correspond, for example, to the glide position or to a braking position.

When the abutment 47 engages with the abutment 104 on the extension 100 of the slide valve rod 40, it serves to move the control piston 20 to its left hand terminal position, thus causing the pressure pipe 24 to connect with passage 34 and to force the operating piston 16 into its right hand terminal position. The pitch of the propeller blades will thereby be reduced. The smallest pitch, which is likewise preferably defined by means of stops (not shown), may in this case be one chosen beyond the 0° adjustment angle, that is, a negative pitch so that the propeller will likewise serve as a brake. The adjustment involving the cutting out of the centrifugal regulator may be effected by the lever 78 as well as by the lever 80.

It is particularly preferable to use an arrangement by means of which the adjusting range of the throttle lever 80 is cooperatively related to an equally large speed regulator adjusting range, so that (assuming that the adjusting lever 78 used for supplementarily adjusting the speed regulator is in its extreme forward or backward positions) the idling adjustment of the throttle lever 80 will, hand in hand therewith, set the speed regulator of the arrangement to the lowest nominal engine speed, and when the throttle lever 80 is set for full load gas feed the regulator will be positively set to its highest nominal speed.

If it is desired to dispense entirely with using the adjusting lever 78 for supplementarily setting the speed regulator, it is still possible to provide further adjustment possibilities for the throttle lever 80 over and beyond its idling and full gas settings in such manner that it will not affect the setting of the butterfly valve, but also so that it will cut out the speed regulator and permit the propeller blades to be set to their limit positions. Such an arrangement is shown in Fig. 2.

The throttle lever in this embodiment is directly connected through the agency of rod 68 with the axially movable slide member 66. The rod 68 carries a projection 106 which slides in a slot 108 provided in the bar 110 and which is positively associated with the butterfly valve 94. The slotted bar 110 assumes a bifurcated form at 112 and 114.

Displacement of the projection 106 in the unbifurcated portion of slot 108 effects displacement of the butterfly valve 94 between its two limit positions which are preferably defined by stops. After reaching one of the limit positions, further movement of the gas lever 80 will serve merely to vary the regulator setting, that is, the setting of the slide valve 20 (see Fig. 1) whereas the butterfly valve 94 will be held fast in its limit position by the projection 106 sliding in one of the forked ends 112 or 114. Suitable indicating arrangements may be provided for controlling the gas lever setting.

The application of the invention is not limited to hydraulically operated adjustable pitch propellers or to a centrifugal regulator, but it is capable of being adapted for use with speed regulated adjustable propellers of any kind.

MAX LORENZEN.

MAY 18, 1943.

BY A. P. C.

M. LORENZEN  
AIRCRAFT PROPULSION  
Filed Oct. 28, 1940

Serial No.  
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2 Sheets-Sheet 1

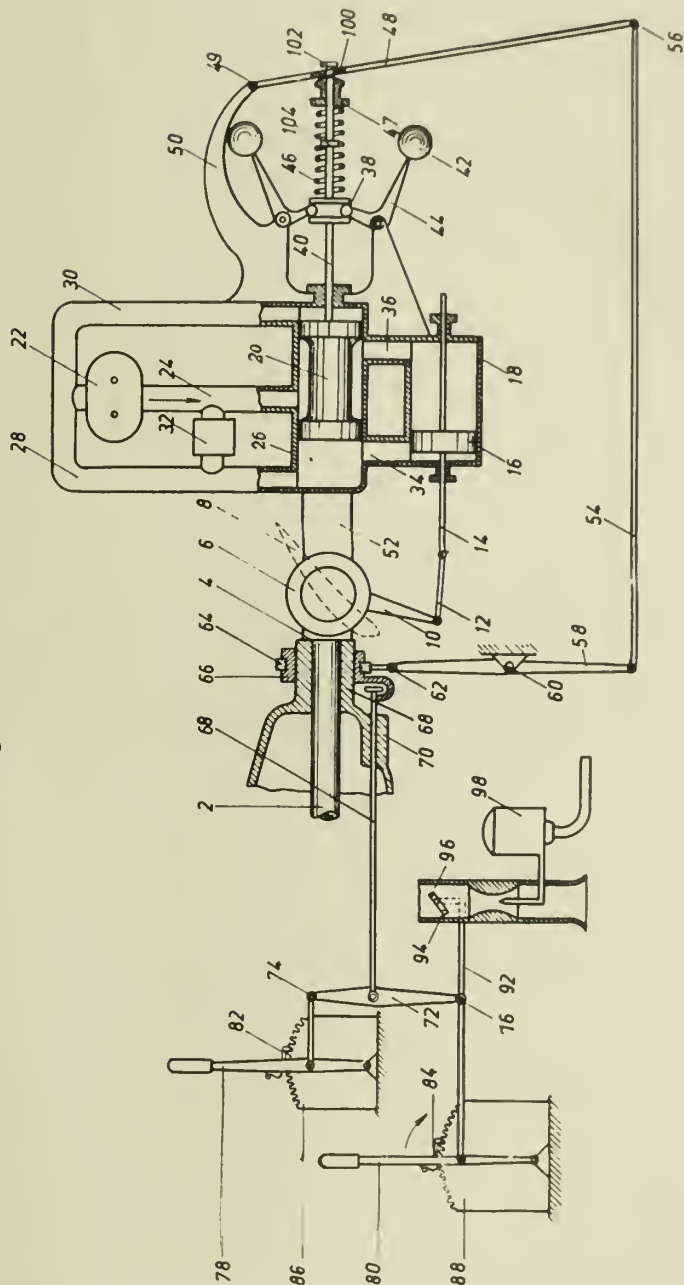


Fig. 1

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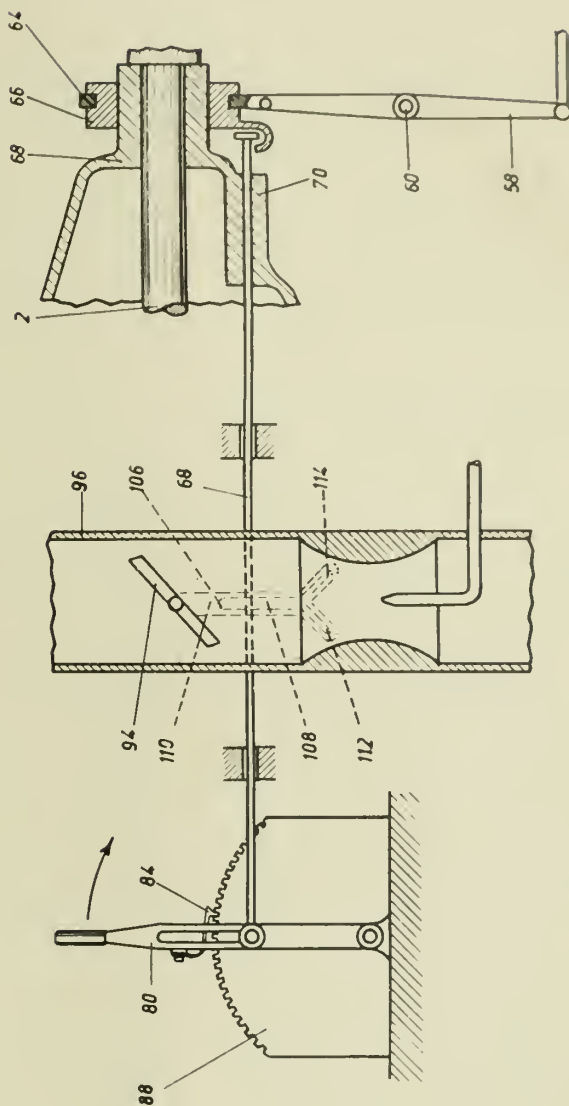


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2 Sheets-Sheet 2

Fig. 2



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# ALIEN PROPERTY CUSTODIAN

## METHOD AND APPARATUS FOR PLATING TUBES

Ulrich Raydt, Osnabrueck, and Karl Staubwasser,  
Unna, Germany; vested in the Alien Property  
Custodian

Application filed October 30, 1940

This invention relates to methods and apparatus for integrally plating tubes, tubular bodies, wires, rods and the like with another metal, the outer metal of which tubes has a higher coefficient of expansion than the inner metal. According to the present invention, mutual deformation of both of the two layers of metal is avoided so as to prevent collapse or buckling of the inner tube while the pressing of one metal upon the other is performed with sufficient force and at such a temperature that the surfaces to be joined are brought into firm or strong contact and thereby integrally united. In view of the higher coefficient of expansion of the metal of the outer sheath, the two sheaths should fit each other as closely as possible so as to reduce to the minimum the amount of mechanical deformation required to effect pressing of one sheath upon the other in effecting the joining at elevated temperatures.

After the tubes have been telescoped one within the other and heated to welding temperature, the outer tube is drawn to a smaller transverse dimension by means of a drawing-iron or similar implement so as to press firmly with its inner surface on the outer surface of the inner tube and integrally unite said surfaces. It is only necessary to effect a reduction in the cross-section of the outer tube such that intimate contact with the inner tube will be established, and, beyond that, further reduction is undesired as unnecessary deformation and possible collapse are to be avoided.

It is advantageous before heating the materials to the welding temperature to draw the inner and outer tubes over one another, in order to obtain from the start as close a contact of the two tubes as possible and also to expel any air present between the tubes. It is also advisable to flange over the edges of the tube in order to exclude air from the surfaces to be united. For the same reason it is recommended that the material should be heated in a reducing atmosphere.

The drawing implement by which the heated materials are drawn one upon the other and plated is preferably arranged directly in front of the heating furnace, so that the material is conveyed from the furnace directly to this implement. According to the new method the reduction in cross-section only proceeds to such an extent that the materials are pressed firmly together. It has also been found that a greater reduction in cross-section should not be effected since, if this occurs, the tube which has the greater ductility at the temperature in question

is pushed off the other tube and plating is not then successfully effected.

It is instructive to note that the drawing-iron which is used for drawing the highly heated tubes is subjected to very heavy wear. Therefore it is advisable to use, instead of a drawing-iron, an iron in which the pass is formed by rotating members.

The production of faultless plating is facilitated if the thin coating of the metal to be plated is deposited on the core metal. This procedure is, however, usually not necessary.

### Example

A steel tube of, for example, 30 mm. internal diameter and 36 mm. external diameter is to be coated and plated with a copper tube. For this purpose a copper tube of an internal diameter of approximately 36.5 mm. and an external diameter of approximately 37.3 mm. is preferably employed. In both cases bright drawn tubes are used. Before the plating the copper tube is de-greased internally and the steel tube is de-greased externally and the tubes are mechanically cleaned, for example by means of brushes.

After the steel tube has a bright metallic surface on the outside, it is preferably copper coated by an electrolytic method by a short immersion in a copper bath and then rinsed at once in clean water. The dry tubes, after being cleaned in this manner, are then treated by a known process with carbon tetrachloride or a chlorinated hydrocarbon, either by allowing the liquid to evaporate on the clean surfaces or by bringing the surfaces into contact with the carbon tetrachloride or the like in gaseous form. The tubes are then inserted one inside the other and pointed conically so that by using a drawing bar the copper tube can be drawn on to the steel tube. Owing to this cold drawing, the air between the two tubes is expelled. The end of the copper tube which projects to the rear after the drawing is flanged over inwardly in order to prevent the access of air, after which the tubes are introduced into an annealing furnace with the point facing the door of the furnace in which they are heated in a reducing atmosphere to a welding temperature of about 1000° C. The tubes are then drawn through a die disposed in front of the furnace which has a pass of a diameter of about 36.7 mm., so that the reduction in diameter amounts to only a few tenths of a millimeter. After the tubes have been plated in this manner, the cooled tube can be drawn to the finished dimensions in known manner, care being taken that the first

pass is effected very carefully and that an intermediate annealing is undertaken in order to prevent the plated metals from coming apart. After the second intermediate annealing, the plating is so firm that a second drawing can be undertaken without taking any special precautions.

Plating is successfully effected by the new process in spite of the views which have hitherto been held to the effect that it is not possible to unite tubes by drawing and that the plating of tubes can only be performed by rolling the tubes. The new process is considerably simpler and more economical than those hitherto known.

As has already been indicated, instead of a fixed or solid die, a die with rolls, rollers or ball-like profiled parts can be employed in which the friction and therefore the wear is considerably less than when a fixed or solid die is employed.

A drawing implement which is specially adapted for carrying out the new process is illustrated by way of example in the accompanying drawing, in which

Fig. 1 shows the implement in elevation, part of the working rolls being omitted;

Figs. 2 and 3 show respectively on a larger scale the two kinds of rolls which are employed; and

Fig. 4 illustrates on a still larger scale how the rolls cooperate one with the other.

Referring to the drawing, the carrier for the rolls is formed by a base-plate 1 having radially arranged plates 2 to which are fixed the supports 3 in which the rolls 4 and 5 are mounted. Elongated holes 6 in the plates 2 enable the rolls to be accurately adjusted.

The essential feature of the new implement is that two different kinds of rolls, which in combination form a circular pass, are employed. The

rolls 4, as shown in Fig. 2, have an arched operative surface 7, the curvature of which corresponds to that of the pass, and conical surfaces 8 adjoin the surface 7 on either side. These surfaces 8 are inclined to one another at an angle of approximately  $150^\circ$ . The rolls 5 also have an arched operative surface 9, the curvature of which corresponds to that of the pass. This working surface 9, however, is slightly greater than the surface 7 of the rolls 4. The working surface 9 of the rolls 5 is undercut, that is to say, the body of the rolls 5 adjacent the surface 9 is narrower than the surface itself and is provided with oblique surfaces 10 against which the conical surface 8 of the rollers 4 bear, as shown in Fig. 4.

During the drawing operation, therefore, the laterally projecting edges of the surfaces 9 are supported by the surfaces 8 of the rolls 4. By this means an approximately closed rigid pass is formed.

Obviously wires, rods and the like as well as in some cases profiled objects can be plated in a similar manner by means of the new process.

When using the new plating process it is generally advisable to work in a protective atmosphere of a reducing or inert gas if the penetration of the oxygen of the air is not effectively prevented by the pressing together of the materials to be plated. The material which has been plated by the new process can be worked up further in known manner by plastic deformation either by hot or cold methods.

This application is a division of our application Serial No. 231,976, filed September 27, 1938, for "Method of plating metals."

ULRICH RAYDT.

KARL STAUBWASSER.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

U. RAYDT ET AL

METHOD AND APPARATUS FOR PLATING TUBES

Filed Oct. 30, 1940

Serial No.

363,564

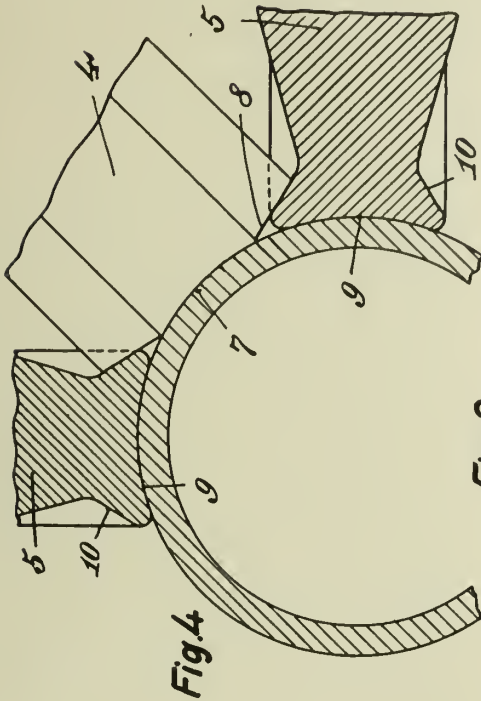
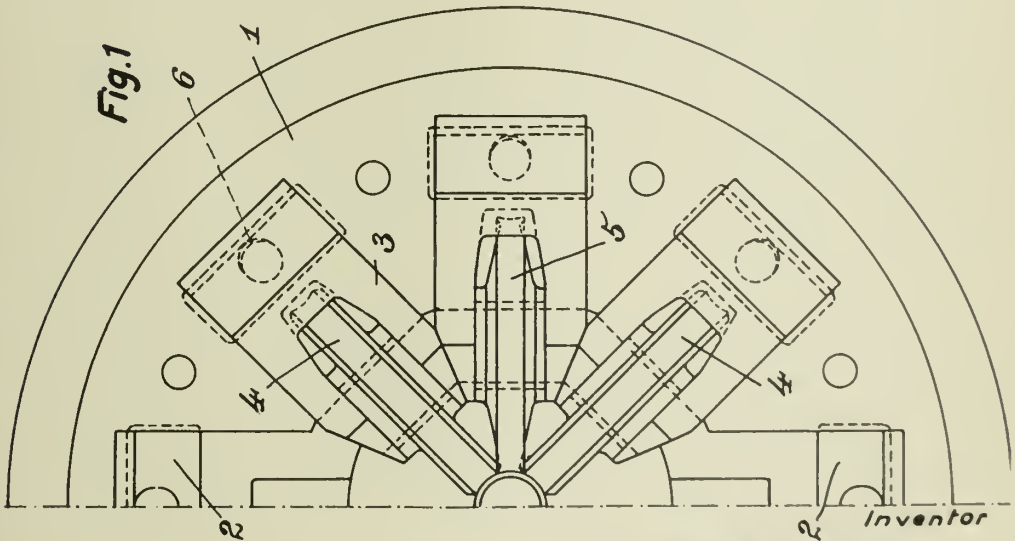
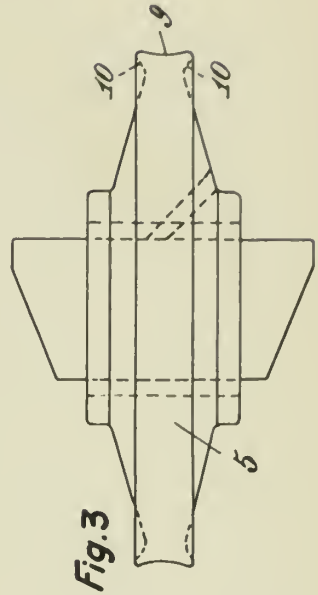


Fig. 2



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# ALIEN PROPERTY CUSTODIAN

## METHOD OF MAKING AND APPLYING A FILTERING MATERIAL

Otto Kuhne, Frankfort-on-Main, Germany;  
vested in the Alien Property Custodian

No Drawing. Application filed November 12, 1940

For clarifying colloidal juices—for instance, raw sugar solutions—use is made of what is called filtering accessories. These are fine-grained or pulverulent substances of a large surface, such as kieselguhr, wood meal, peat or lignite dust, which are stirred up with the solutions to be treated at heat, followed by a filtration process. The colloids contained in the solution—and particularly the substances causing turbidity and the mucins—settle on the surface of the filtering accessory; hereby the grain interval of the filter bed will be contracted but to a slight extent, so that the fluid to be treated is allowed to pass through the filter bed at a high filtration rate. Thus it is the object of the filtering accessory not only to free the solution from substances causing turbidity but also to accelerate the filtration which otherwise—for instance, in the case of filtration through cloths—will soon come to a standstill because the mostly mucous colloids choke the pores of the filtering area.

Experience has shown that with this mode of operation the fineness of grinding the filtering accessory is of particular importance. In this respect blast-sifted kieselguhr has proved superior to any other filtering accessories by its uniform and great fineness of grinding—up to 90% of portions smaller than .04 mm—what applies particularly to comparison with the carbonizable filtering accessories referred to above. Particular trouble is encountered in applying the latter substances also by reason of the alkalinity of the solutions, as occurring as a rule in the sugar industry and having a dissolving effect on the humic and lignin solutions respectively of these filtering accessories, so that discolorations take place in the case of thus treated juices.

It has been found that a carbonaceous filter material equivalent to kieselguhr can be produced by distilling carbonizable substances having a great fineness of grinding at temperatures in excess of 450° C. Here it is of importance to accomplish the grinding prior to the low-temperature carbonization; if proceeding in the converse sequence, it will be impossible to obtain a product possessing high-grade clarifying and filtering properties from the resulting lumpy carbonization product even by selective grinding. This effect achieved by grinding the crude substance is the more surprising since it had to be presumed that pulverulent material would agglomerate or stick together at the time of low-temperature carbonization, i. e., the original grain structure of the finely ground initial material would change to disadvantage.

To obtain, at the same time, a good clarifying effect and high filtering capacity, the material to be ground must contain a high percentage of fine constituents, a minimum content of 60% of por-

tions smaller than .06 mm having proved particularly satisfactory.

The low-temperature carbonization also destroys all alkali-soluble compositions, so that the material distilled at low temperature fails to give off organic substances any longer, which are likely to exercise a discolouring effect on the solutions to be treated. Even in the case of very high alkalinity—pH 13–14—the solutions treated with the new filtering material remain perfectly clear and do not change colour.

The superior clarifying and filtering capacity of the product made by the new process, e. g., from finely ground lignite as compared with low-temperature coke made from lignite of equal grade and ground subsequently appears most distinctly when applied to a colloidal beet sugar solution. While the new product yields the same clarifying effect—ascertained by measurement of turbidity—as kieselguhr, the ground lignite low-temperature coke gives only half the clarifying capacity. Still more striking is the difference in the filtration rate—as a proof of the filtration capacity expressed in hours of passing time required for one charge of 20 hectolitres per sq. m.—this time is 3 hours for the new product and 25 hours for the ground low-temperature coke (while kieselguhr as standard filtering accessory requires 5 hours of passing time).

All substances that can be distilled at low temperature, i. e., especially wood, peat and lignite, lend themselves to the manufacture of the filtering material. Particularly satisfactory filtering capacity is shown by the products distilled at low temperature and made from porous raw materials, the weight of which is less than 400 grams per litre; for instance, a younger, lighter peat affords a better filtering material than does an older, heavier peat.

If it is intended to employ the filtering accessories obtained by the new process in such refining processes where at the same time a discoloration is to be obtained, such an additional effect can be achieved by admixture of bleaching agents or decolorants, such as, e. g., active carbon. The same object will be obtained in many instances by admixing gel forming substances which are known to cause precipitations in aqueous solutions. Additions of this kind are, e. g., aluminum sulphate, phosphates, carbonates and also aluminium powder. These mixtures show specific refining effects in the case of colloidal solutions—e. g., raw cane sugar—since a high clarifying effect is due to the gels formed by the action on these solutions, so that particularly brilliant juices will be obtained by using these mixtures of filtering accessories and gel-formers.

OTTO KUHNE.



# ALIEN PROPERTY CUSTODIAN

## ECHO SOUNDING DEVICE

Peter Orlich, Günther Negel and Hans Hartz,  
Kiel, Germany; vested in the Alien Property  
Custodian

Application filed November 14, 1940

This invention pertains to an echo sounding apparatus of the type comprising measuring mechanism which travels at a constant rate during the period between the emission of a sound signal and the return of the echo and which gives an indication at the time the echo returns and is subsequently restored to starting position. In this type of apparatus difficulty arises through the periodic return to zero of the measuring mechanism, due to the fact that under certain circumstances, for instance at low altitudes, it is necessary to pause in the indicating position of the measuring mechanism, until the return of the latter to zero position is initiated. At high altitudes the time of pause in the indicating position is short. Also the time required to return the mechanism to zero is short, but for this reason the following pause in the zero position until the sending out of a new sounding signal is long. However, since the measuring device has to be made up for a certain range of altitudes, this superfluous period of delay had to be provided for. On this account the succession of soundings was relatively slow. Such losses of time are now prevented and higher sounding speeds are obtained, by combining the indicating apparatus with a detaining relay providing for the return to zero of the measuring mechanism, which is set in operation by the echo. The result is that at the instant when the echo is received, and thereby the measuring procedure of the measuring mechanism is terminated, a cut-out relay comes into action, having a delay only sufficiently long so that the interval will provide for the resetting of a stationary indicator, for example, for the transmission from the measuring mechanism by remote control to the indicating device. It is then possible to increase the rapidity of repetition of the soundings by varying the rotary speed of the shaft which actuates the sound emitting switch, either automatically or by hand. It is also possible to arrange the sound emitting switch in such a way that it is actuated again immediately upon the return of the measuring apparatus to zero position. The conformance of the sequence of soundings to the elevation to be measured can thereby take place continuously or intermittently.

The invention will be described in detail by reference to the accompanying drawing, which shows diagrammatically one illustrative form of the apparatus.

This apparatus comprises a timing and indicating mechanism A, a repeater mechanism B, a detaining mechanism C, and a signal mechanism D. The timing mechanism is a known time interval measuring device, shown, for example, in the Patent No. 2,032,893 to Bernhard Settegast and Wilhelm Rudolph, which comprises a constantly running rotary magnet 42 mounted upon

a shaft 41 rotating at constant speed, and opposite the running magnet a holding magnet 43. Upon an axially shiftable shaft 45 there is fastened an armature disk 44 between the magnets 42 and 43, which are separated by a narrow air gap. Upon the shaft 45 of armature disk 44 is fixed a heart cam 46, acting through a spring-influenced control arm 47 to set an indicator armature disk 48. The armature disk 48 can be held stationary by a locking magnet 49, whereby a pointer 50 fixed rigidly to the armature disk 48 is locked. The pointer 50 can be made as a stationary indicator itself, or it can be constructed as a control device for operating an auxiliary indicating device, by means of electrical remote control, in a manner not illustrated in the drawing, but shown in the copending application of Peter Orlich and Hans Hartz, Serial No. 285,310, filed July 19, 1939.

The repeater mechanism B comprises a constantly rotating shaft 54 bearing a cam disk 53 which operates a switch 53a controlling the circuit of a sound emitter 52, for instance of the kind shown in Fig. 1. The sound emitter circuit is preferably controlled by switch 53a through a relay, in a manner not shown in the drawing, but which will be readily understood.

The detaining mechanism C comprises a second time interval measuring device similar to the one first described, comprising a constantly running rotary magnet 55 mounted on a drive shaft 56 running at constant speed, a holding magnet 57, and a disk armature 58 fixed to an axially shiftable shaft 58a. The shaft 58a has fixed to it cams 63, 64 and 65 to operate switches 66, 68 and 71 in a manner to be described presently. The shaft also has fixed to it a heart cam 72 acting with a spring-influenced arm 72a in a manner which tends to return the shaft to a certain zero position, when the armature 58 is released by the demagnetization of both magnets 55 and 57.

The signal control devices D include, in addition to the signal emitter 52, a starting switch 51 for the measuring mechanism which may be a pneumatic switch such as 38 in Fig. 3; a relay-operated switch mechanism 60, 61, 62; and an electron tube 59 to the grid of which the echo receiver (not shown) is connected, for instance, in the manner shown in the above-mentioned Settegast and Rudolph Patent No. 2,032,893.

The apparatus is shown in its starting position at the instant the repeater cam 53 has opened switch 53a to energize the sound emitter 52. At this time, which terminates the condition of rest of the apparatus, the holding magnet 43 of the measuring mechanism stands energized, switches 51 and 68 being closed, and shaft 45 is thereby held at zero position. In the condition of rest of the apparatus prior to the signal emission,

switches 76 and 70 are both open and the circuits of running magnet 42 of the measuring mechanism and holding magnet 57 of the detaining mechanism are broken. The circuit of running magnet 55 of the detaining mechanism is broken by switch 74. The shaft 58a is held in position of rest by heart cam mechanism 72, 72a. The relay 60 is excited through its circuit including electron tube 59 and holds closed switch 62 controlling the circuits of running magnet 42 and holding magnet 57. The circuit of locking magnet 49 is closed through switch 62, thus retaining the pointer 50 in its previously set position.

Just prior to the actuation of switch 53a by cam 53, the cam 75 closes switch 76 and thus excites the running magnet 42 of the measuring mechanism and holding magnet 57 of the detaining mechanism. The armature 44 remains attracted by holding magnet 43, but armature 58, which has been free, is attracted by holding magnet 57 and held in its normal angular position shown. At the instant that the signal is emitted switch 51 is momentarily opened and the circuit of holding magnet 43 is broken, which allows the armature 44 to jump to the previously energized running magnet 42. As soon as armature 44 begins to turn, switch 70 closes, completing holding circuits for the running magnet 42 and holding magnet 57. This condition continues until the echo is received, at which time simultaneously the measuring mechanism 42—44 stops the shaft 45 and the detaining mechanism 55—57 sets in operation the shaft 58. This occurs, according to the example illustrated, through the effect of the echo upon the grid charge of the electron tube 59, which momentarily blocks the circuit of the electron tube and demagnetizes relay 60. The contacts of switches 61 and 62 open the switch 61, serving to cut out completely the exciting current of relay 60, while switch 62 cuts out the running magnet 42 of the measuring mechanism and the holding magnet 57 of the detaining mechanism. Hereby the armature disk 44 of the measuring mechanism is attracted by the holding magnet 43, the switch 51 having meanwhile closed, and is brought to rest, locking the heart cam 46 in an angular position which corresponds to the time interval between the signal emission and the echo reception. If this position is different from the one which controlled the previous setting of the pointer 50, the spring of lever 47 is under tension, tending to pull the disk 48 toward the new setting. The circuit of holding magnet 49 is broken by switch 62 simultaneously with the opening of the circuit of running magnet 42, so that the armature disk 48 is released and allowed to assume the new position corresponding to the setting of heart cam 46, moving with it the pointer 50. The opening of switch 62 breaks not only the circuits of running magnet 42 and holding magnet 49, but also the circuit of holding magnet 57 of the detaining mechanism. The running magnet 55 having been excited by closure of switch 74 when shaft 45 began to rotate, armature 58 jumps to the running magnet, when the holding magnet 57 is deenergized, and shaft 58a begins to rotate. Cams 63, 64 and 65 become operative upon their respective switches successively. Cam 63 first closes switch 66, which applies voltage to relay 60 through a resistance 67 and thereby excites the relay. Switches 61

and 62 are thus closed and the holding circuit of relay 60 through tube 59 is restored to ready condition. The closure of switch 62 completes the circuit of holding magnet 49, locking the armature disk 48 and its pointer 50. Shortly after, the cam disk 64 momentarily opens switch 68, breaking the circuit of holding magnet 43 and allowing armature 44 to jump back to the running magnet 42, previously excited by closure of switch 62. The rotation of shaft 43 thus recommences and continues until cam 69 raises switch 70 and interrupts the circuit of running magnet 42. The circuit of holding magnet 43 having been reestablished by closure of switch 68 after its momentary opening, the armature 44 jumps to the holding magnet and holds the shaft 45 in starting position.

Meanwhile, the detaining mechanism 55—58 is restored to starting position in the following manner: Upon the closure of switch 62 the circuit of holding magnet 57 was completed and this magnet reenergized, but without effect, at that time upon armature 58, which was held by running magnet 55. A short time after the cam disk 64 again sets in operation the measuring mechanism shaft 45, cam disk 65 opens switch 71, breaking the circuit of running magnet 55 and allowing the armature 58 to jump to the holding magnet 57, which had been reenergized by closure of switch 62. The armature 58 and its shaft 58a are held stationary until shaft 45 has reached the starting position shown in the drawing, at which time the circuit of holding magnet 57 is broken by the opening of switch 70. The armature 58 being now freed from both magnets 55 and 57, the heart cam mechanism 72, 72a, turns the shaft 58a, with its cams 63, 64, 65, back to starting position. The closure of switch 71, as cam 65 moves away from it, is without effect, because the circuit of running magnet 55 is open at switch 74. The whole apparatus is now again in ready position.

This conception for eliminating the waste time delay is obviously not limited to the illustrative example. The example itself, in the first place, can be changed in a number of respects. For instance, the shafts 41 and 56, or even all the shafts 41, 54 and 56, can be driven in common. It is also possible to unite the two timing mechanisms 42—44 and 55—57. Also the cam disks can be replaced by equivalent devices, for instance induction switches. Furthermore, it is not necessary to limit the device to the particular form of detaining relay, as shown in the illustrative example. Any desired form of detaining relay could be used, the detaining time of which is just long enough to allow for a setting of the stationary indicator. Furthermore, the detaining relay, under certain conditions, can be replaced by an equivalent electrical reversing mechanism, known per se, which operates with a given delay.

Finally, all these devices can be used in any kind of echo sounding apparatus, which operate by the method of returning to zero position. They are therefore not limited to acoustical soundings, but can also be used with advantage, for example, for electromagnetic echo soundings.

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GÜNTHER NEGEL.  
HANS HARTZ.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

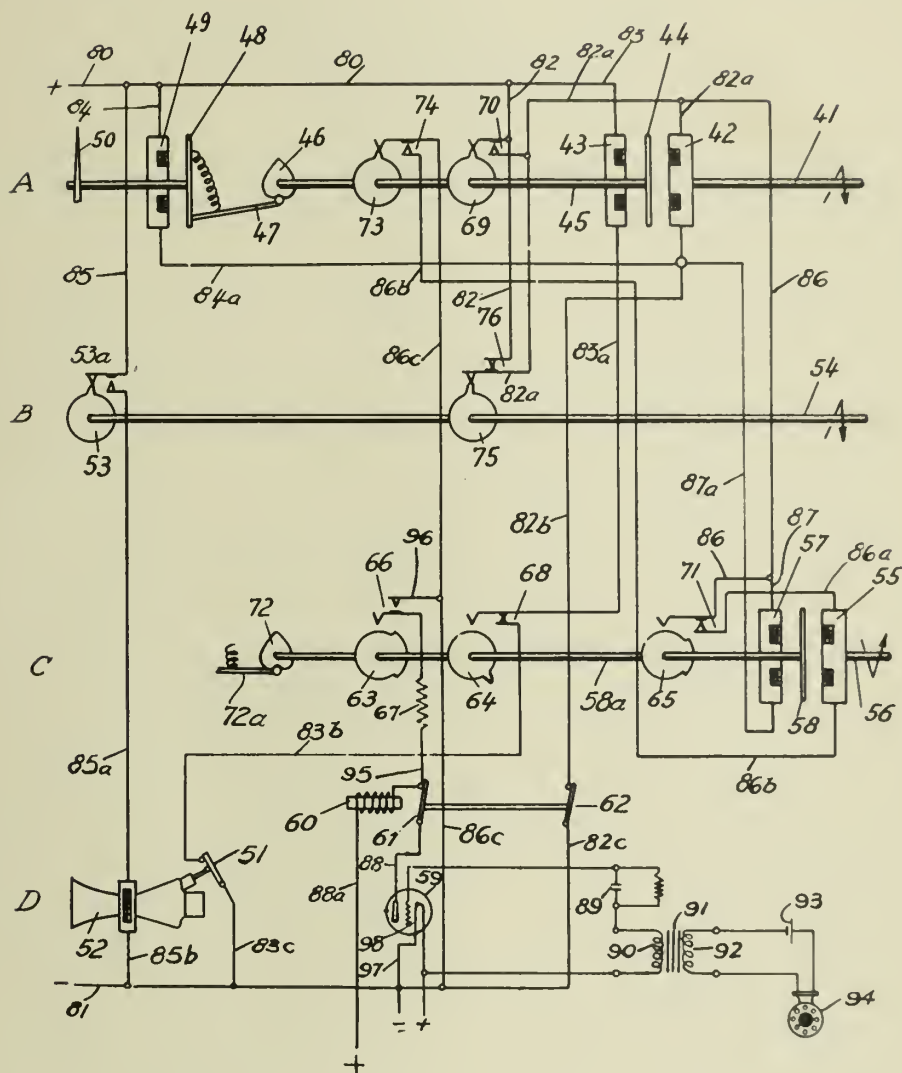
P. ORLICH ET AL

ECHO SOUNDING DEVICE

Filed Nov. 14, 1940

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365,647



INVENTORS  
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# ALIEN PROPERTY CUSTODIAN

## TELEGRAPHY TRANSMITTER

Fritz Hennig, Berlin, Germany; vested in the  
Alien Property Custodian

Application filed November 15, 1940

In keying radio transmitters with telegraph devices check-up reception by radio is not always feasible. This, in the first place, is impossible when no receiver apparatus is available. Also, where the transmitter and the receiver are quite close together so that, for instance, they have a joint antenna and ground, or a joint source of current supply, a coupling may arise between transmitter and receiver of such a nature that the telegraphic signals will be vitiated or obliterated. The monitor record will become unclear or illegible. In all of these instances the check-up message must be made locally, in other words, the circuitous way through radio transmitter and receiver is not feasible.

The keying circuit of radio telegraphic transmitters is often designed for direct current and is so operated, for instance, that the keying contact of the telegraphic transmitter opens the closed circuit. Reception, however, is mostly by way of a tonal-frequency circuit.

Now, according to the invention, operation of these different circuits is made feasible in a simple way by causing a single telegraphic transmitter to key simultaneously several circuits in which currents of different kind are flowing.

In instances as hereinbefore mentioned, the various circuits are preferably connected in parallel in relation to the telegraphic transmitter, while the alternating current of one of the circuits is excluded by suitable stopper circuit means in the other circuit. The direct current is kept out of the alternating current circuit by a condenser included therein.

For the sake of simplification, under certain operating conditions, which shall be explained more fully further below, it is possible also to resort to a pure series arrangement of all circuit elements. The radio transmitter is then blocked off by means of a condenser for the tonal-frequency signals, the said condenser being connected in parallel relation to the output terminals.

Figs. 1 and 2 of the appended drawing illustrate exemplified embodiments of the invention which show further details of the scheme.

The keying circuit of the radio transmitter starts from battery B and runs through the telegraphic signal transmitter or keying means TS, stopper circuit F to the radio transmitter DS. This stopper circuit may be as shown a parallel circuit parallel resonant to the tonal frequency. The telegraphic device TS may consist, for instance, of a picture point scanner and transmitter drum. The tonal-frequency circuit starts at the source of tone current supply S and runs through condenser C, telegraphic transmitter TS, primary winding 10 of transformer U and back to the said source of supply S. When sending through the telegraphic instrument TS both circuits are keyed. The entrance of direct current into the tonal-frequency circuit is precluded by condenser C, while stopper or rejector circuit F precludes tonal frequency from the direct-current circuit. The telegraphic receiver is united with terminals TE.

In the case of the embodiment shown in Fig. 2, the assumption is made that the direct-current resistance of the primary 10 of transformer U and of the source of tonal frequency S is very low. In this case, both may be looped in the keying circuit of the radio transmitter without any appreciable drop or loss of direct current being incidentally occasioned. The direct-current impulses in the primary winding 10 of transformer U will not affect the monitor record. Condenser C short-circuits the input end of the radio transmitter DS for impulses of tonal frequency. A resistance R is provided for insuring current limitation. Also, in this circuit arrangement mutual disturbance or interference of the direct-current and tonal-frequency impulses is avoided.

FRITZ HENNIG.

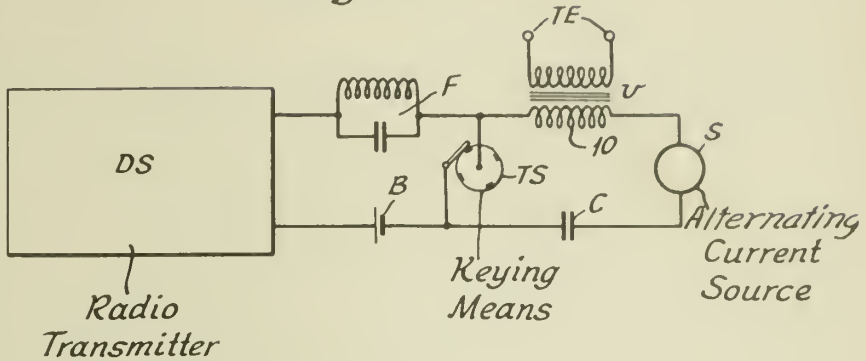


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BY A. P. C.

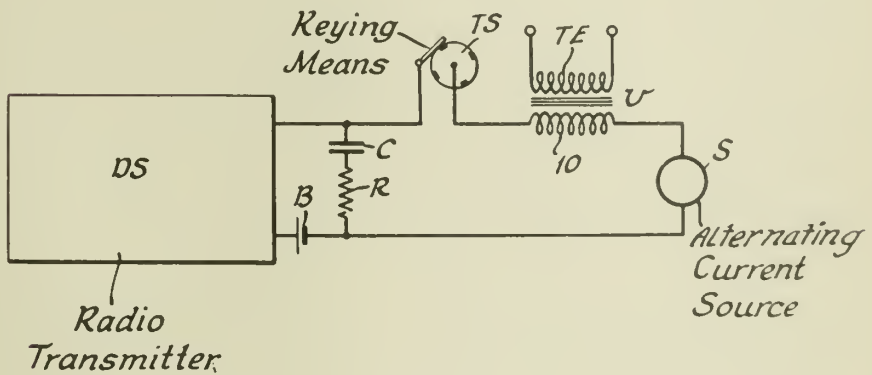
F. HENNIG  
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*Fig. 1*



*Fig. 2*



INVENTOR  
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# ALIEN PROPERTY CUSTODIAN

## ELECTROMAGNETIC SIGNAL HORN

Gustav Zeininger, Oberesslingen, Germany;  
vested in the Alien Property Custodian

Application filed November 23, 1940

This invention relates to an electromagnetic signal horn, more particularly for vehicles. In electrical plants on vehicles, the voltage is liable to variations within a wide range depending on the charging condition of the battery. Owing to these variations of the voltage signal horns oftentimes produce a discord or impure note owing to an operating voltage exceeding the nominal voltage of the device.

It is an important object of the present invention to provide means for avoiding the above mentioned effect of deterioration of the sound of the horn as a result of variations of the voltage.

Another object of the present invention is to provide means for quenching the sparks at the interrupter contacts.

With these objects in view, I provide the electromagnet of the horn with an auxiliary winding which is shunted to the main winding and consists of a thinner wire, the direction of winding and the connections being made so that the magnetic effect of the auxiliary winding counteracts that of the main winding.

The invention will be better understood by reference to the following detailed description in connection with the accompanying drawing, showing by way of example and purely schematically a diagram of connection of a signal horn device having the invention applied thereto.

As will be noted from the drawing, the horn comprises an electromagnet having a core 1 and an armature 2 fixedly connected to a diaphragm 3 and controlling by its oscillations a contact spring 4 of an interrupter including two cooperating contacts 5. The diaphragm at its rim is held between rings 12. The stationary core 1 of

the magnet is provided with a main winding 6 and an auxiliary winding 7, said windings being inductively intercoupled. The main winding 6 is connected in series with the contacts 5 for control by the same, whilst the auxiliary winding 7 is connected in parallel with the main winding and consists of a smaller gauge wire, having, for instance, half the diameter of the main winding 6. The auxiliary winding 7 therefore absorbs very little current only and is wound so that its magnetising effect indicated by arrow 13 counteracts that of the main winding 6 indicated by arrow 14 whilst the potential of self inductance of the main coil 6 counteracts that of the auxiliary coil 7. Through a push button 8 the horn may be connected to a battery 9 which through an automatic charging switch 10 may be charged from a generator 11.

It has been found that by provision of the auxiliary winding 7 the horn produces an undistorted, clear sound even with a higher than its nominal voltage at its terminals. Moreover, the auxiliary coil 7 produces a good spark quenching effect at the interrupter contacts 5, 5, so that the condenser, which usually has been arranged in parallel with the interrupter, may be dispensed with.

The method and apparatus of the present invention have been described in detail with reference to a specific embodiment. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than that specifically described and illustrated in the drawing.

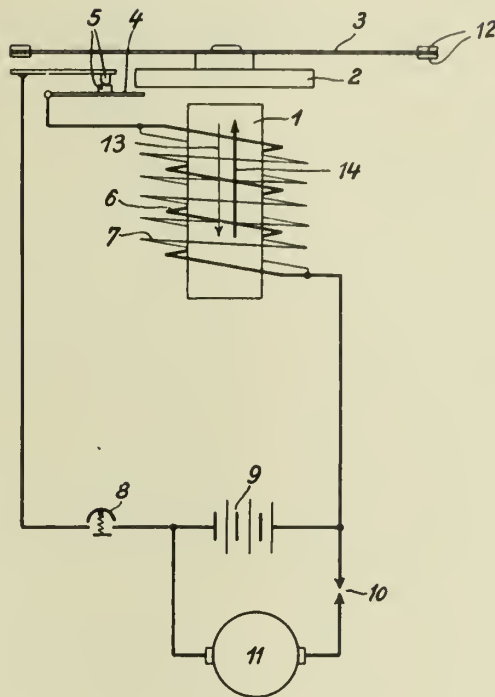
GUSTAV ZEININGER.



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G. ZEININGER  
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366,911



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# ALIEN PROPERTY CUSTODIAN

## ELECTROMAGNETIC SIGNAL HOOTER

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Application filed November 23, 1940

This invention relates to electromagnetic signal horns or hooters of the type used in motor vehicles.

It is an important object of the present invention to provide means in devices of the type referred to for ensuring an efficient spark quenching at the contacts of the interrupter.

Another object of the invention is to provide means for preventing the distortion of the sound of the horn produced in the conventional horns as a result of a too high operating voltage, which of course is due to the variations of the battery voltage arising from the different charging conditions of the same.

With these objects in view, I provide on the electromagnet an auxiliary winding which is connected across the contacts of the interrupter and consists of a smaller gauge wire than the main winding, the auxiliary winding being arranged so as to produce a unidirectional magnetising effect with that of the main winding.

The invention will be better understood by reference to the following detailed description in connection with the accompanying drawing, showing by way of example and purely schematically a diagram of connection of a signal horn device having the invention applied thereto.

It will be seen from the drawing that the horn comprises a diaphragm 1 connected to, and oscillated by, an armature 2 forming part of an electromagnet 3 including a main winding 4 and an auxiliary winding 5 being inductively intercoupled. The diaphragm at its rim is held between rings 14. The auxiliary winding 5 consists of a thinner wire than the main winding 4, for

instance, of a wire having half the diameter of the main winding 4, and is arranged to cause a magnetisation in the direction of arrow 12, i. e., in the same direction as that of the main coil 4 which is indicated by arrow 13.

The armature 2 actuates a contact spring 6 of an interrupter whose contacts 7, 7 are connected in series with the main coil 4, whilst the auxiliary winding 5 is connected in parallel with the interrupter contacts 7, 7, whereby the potential produced at the terminals of the main coil 4 due to selfinduction is permitted to equalize. Owing to the spark extinguishing effect thereby attained the condenser which usually is connected across the interrupter contacts may be dispensed with.

Moreover, it has been found that by provision of the auxiliary coil 5 a pure sound is produced even if the operating voltage exceeds the nominal voltage of the horn. Thus, the purity of the tone produced by the horn becomes independent of the voltage variations of the source of current 9 of the horn. The current consumption of the auxiliary coil 5 is very small.

A push button serves for switching in the horn. The battery 9 for the horn may be charged from a generator 11, through an automatic switch 10.

The method and apparatus of the present invention have been described in detail with reference to a specific embodiment. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than that specifically described and illustrated in the drawing.

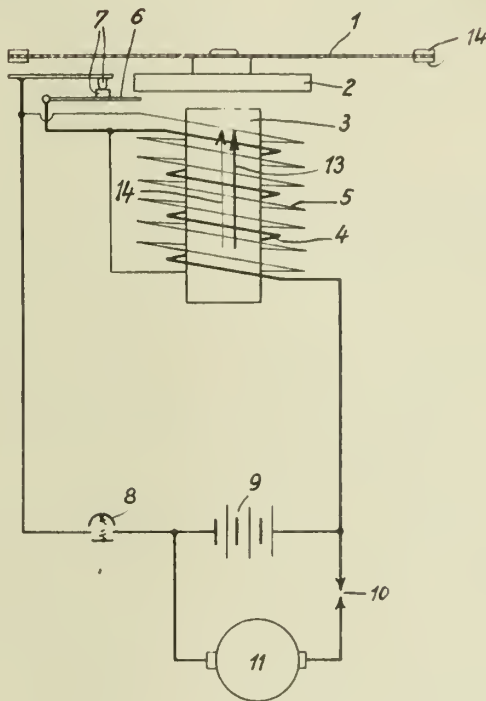
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Serial No.  
366,912



Inventor  
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# ALIEN PROPERTY CUSTODIAN

## INDUCTANCE DEVICE

Theodor Willers, Berlin, Germany; vested in the  
Alien Property Custodian

Application filed November 23, 1940

On employing mass cores for high frequency coils of receivers and transmitters the core is permeated not only by magnetic field lines, but also by electric field lines. Such an electric field line is shown dotted in the accompanying figure in which the coil is designated by  $S_p$  and the core is represented in 1 to 5. Since the insulating material of the mass core entails dielectric losses, a shielding sheet is arranged as is known between the coil and the core and which in order to avoid eddy currents is either slotted longitudinally, or it consists of several axially oriented sheet metal strips.

These shields have the drawback that in the presence of high potentials of high frequency, such as appear for instance in transmitters, a flash-over can occur between the coil end carrying a potential and the shielding means. Such danger exists to a lesser extent when the shielding means is absent since, on account of the low conductivity of the mass core a part of the potential acts at the mass core so that therefore only the residual part exists in the air gap between coil and mass core.

In order to avoid this drawback and to dispense with a special shielding mantle, it is proposed in accordance with the present invention to sub-divide the core in the axial direction of the coil

through interspaces into several separate disks and to fill out the interspaces with an insulating material of low loss and a dielectric constant which is lower than that of the core, more especially to fill out the said spaces primarily with air.

The accompanying figure shows an example of construction. The core consists of five parts 1 to 5 having spacers arranged between each other which have a thickness of about 0.5 to 1 mm and consisting for instance of ceramic material having a low dielectric constant. It is thereby accomplished that the capacitive resistances of the interspaces are higher than those of this disks of the core. Consequently the greater part of the total potential exists in these interspaces. If the spacers have a lower loss than the insulating material of the core, the total dielectric losses will thereby be reduced. In order to maintain low the dielectric losses of the supporting body of the coil, the latter likewise consists suitably of ceramic material of low loss.

The total permeability of the core will in fact be slightly reduced by the interspaces, but this reduction is so slight that the advantage of the lower losses predominates.

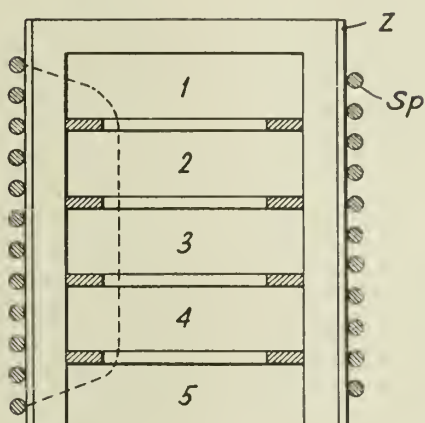
THEODOR WILLERS.



PUBLISHED  
MAY 18, 1943.  
BY A. P. C.

T. WILLERS  
INDUCTANCE DEVICE  
Filed Nov. 23, 1940

Serial No.  
366,919



INVENTOR  
THEODOR WILLERS  
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# ALIEN PROPERTY CUSTODIAN

## METHOD OF TRANSMITTING CHARACTERS BY MEANS OF REVOLVING DRUMS

Rudolf Hell, Berlin-Dahlem, Germany; vested in  
the Alien Property Custodian

Application filed November 23, 1940

This invention relates to a method of transmitting characters by means of revolving drums.

Arrangements for the transmission of characters are well known in the art in which a transmitting drum with characters built up of image points is employed. The individual scanning lines of the characters are produced in this case one after the other on the peripheral line of the drum. At the receiving end the characters transmitted as sequences of image points are again correspondingly composed. The corresponding scanning springs are, as is well known, brought into engagement with the drum in its position of rest at the transmission side by actuating keys and are removed from the same after the drum has made a complete rotation. In this case it is preferable to automatically stop the transmitting drum upon the completion of each rotation and to start the same again by depressing another key. Such methods permit only an operation of the keyboard without hindrance if at least five characters per second can be transmitted. It is therefore necessary to accelerate in a very rapid manner the relatively great mass of the transmitting drum and to stop the same immediately. Such apparatus produce in practice an objectionable noise and a considerable wear of the coupling arrangement.

The present invention has for its object to provide an improved arrangement, whereby the transmission of five and even more characters per second is made possible without it being necessary to suddenly accelerate or brake the transmitting drum or the corresponding member at the receiving side.

According to the invention the drum is not suddenly started, but gradually accelerated and retarded before stopping, particular measures being taken in compensating again the influence of the non-uniform drum speed on the transmission of the image elements.

It is known in the art when employing apparatus for the transmission of images to couple the image drum gradually with the driving device so that it starts smoothly and attains the full speed after a given period. A retardation of the drum for stopping the same according to the invention is not provided in this arrangement, since the image drum is not stopped after each rotation. The braking and the retardation prior to the stopping in the case of masses, for instance, of the type drum of a typewriter moved instantaneously in rapid sequence is well known in the art. In these arrangements a gradual starting is not possible. Since in these

two arrangements other transmission methods differing from that of the invention are employed, no measures have been taken to compensate for the influence of the non-uniform drum speed on the transmission of the characters.

The measures according to the invention for compensating the non-uniform drum speed may consist in the fact that the scanning member at the receiving end is driven with the same non-uniform speed as the transmitting drum. However, also the scanning lines and the character elements may be arranged on the drum in a distorted manner. The predistortion of the image to be transmitted is effected as is well known by cathode-ray receivers for compensating the distortions resulting during the magnetic deflection. Here the predistortion is affected by the optical method.

The non-uniform drive of the transmitting and receiving system may be effected according to the invention by means of a gearing which converts the uniform rotation of the driving motor in a rotation with non-uniform speed. Such gearings are well known as double cranks, crank knees, anti-parallel cranks and three-wheel gearings or the like. The drive may naturally be also effected with the aid of a crank or other arrangements. In these gearings the roller is started and stopped according to a predetermined function.

Fig. 1 shows a longitudinal sectional view and

Fig. 2 a cross-sectional view taken on the line A—B of Fig. 1 of the arrangement according to the invention. In this embodiment the retarded starting of the drum is attained by the employment of a cycloid gearing. In this case a gear 2 is firmly mounted on the stationary shaft of the roller 1. The driving motor 3 rotates the revolving gear 4 with the aid of the coupling elements 5. The friction coupling 5 rotates the arm 6, insofar as the lug 7 is not in engagement with the armature 8 of the magnet 9. The gear 10 meshing with the stationary gear 2 is rotatably mounted on the coupling arm 6. The driving gear pin 11 moves in the slot 12 which is secured to the drum 13. The drum 13 is mounted on the shaft 1. In Fig. 1 is shown the position of rest of the arrangement. If the magnet 9 is energized and the magnet armature 8 is attracted, the nose 7 is released. The arm 6 begins immediately to rotate with the speed of the gear 4. By means of the stationary gear 2 and of the revolving gear 10 the driving gear pin 11 as well as the drum 13 are started at a slowly accelerated angular speed and the maximum speed

thereof is reached after a revolution of  $180^\circ$ , in order to be then slowly retarded at the beginning and still more later on. Shortly before reaching again the initial position, the speed of the drum 13 is extremely small. If the magnet 9 is not highly energized the armature 8 will stop the nose 7 and the drum 13 will practically come to rest without impact.

In this embodiment it is assumed that the diameters of the gears 2 and 10 are equal. The starting curve of the drum may be varied by varying the gear diameter as well as by varying the position of the driving gear pin 11 on the gear 10.

The constructions so far mentioned employ a gearing between the driving shaft and the roller, which gearing starts the drum accurately according to a predetermined function. It is also possible to start and stop the drum not according to a predetermined function, but to cause the drum to start slowly and brake slowly only by means of a sliding clutch (friction clutch).

An embodiment for this purpose is shown in Figs. 3 and 4. The driving motor 14 rotates the shaft 17 firmly secured to the gear 16 through the gears 15, 16. On the shaft 17 is firmly secured a ratchet wheel 18 and loosely mounted a clutch part 19. The latter cooperates as shown in Fig. 4 with a pawl 20 which is pressed against the ratchet wheel 18 with the aid of a spring 21, provided that the pawl 20 is not released by the armature 22 of the magnet 23. This known locking clutch in the released state of the magnet armature 22 connects the revolving shaft 17 with the clutch part 19. On the clutch part 19 is loosely mounted the drum 25 frictionally coupled by the spring 24. The drum 25 is also loosely mounted on the revolving shaft 17. The drum 25 carries a driving drum pin 26 which when the drum is at rest is in engagement with the plate spring 27. A nose 28 arranged on the clutch part 19 can rotate the pin 26. If the magnet 23 is energized by a starting impulse and the armature 22 is attracted, the pawl 20 comes into engagement with the continuously revolving ratchet wheel 18 by the action of the spring 21, thereby causing the part 19 to rotate with the speed of the shaft 17. The revolving clutch part 19 will set the drum 25 relatively slowly and above all smoothly in rotation under the action of the very loosely adjusted spring 24 so that the pin 26 comes out of engagement with the spring 27. The spring 24 is so adjusted that in the case of the splitting up of the characters into seven lines as is assumed in this case the nose 28 has caught up with the pin 26 at the latest after a rotation of  $60^\circ$  and rotates the drum 25 at full speed owing to the rigid coupling brought about between the pin 26 and nose 28 of the clutch part 19. As soon as the part 19 has made one complete rotation the latter upon the release of the magnet armature 22 is disengaged from the ratchet wheel 18 by the pawl 20 and the clutch part 19 comes to rest. The drum 25 which had still its full speed continues to rotate by means of its nose, i. e., in the case of a proper adjustment of the spring 24, at a considerably reduced speed until the pin 26 comes into engagement with the spring 27 and the drum 25 stops.

Starting and stopping of the drum is effected in this case in a completely smooth manner. A rigid coupling between the clutch part 19 and

the drum 25 is brought about in the embodiment shown only for a rotation of  $300^\circ$  of the clutch part 19, whereas for the duration of the remaining rotation no rigid coupling is brought about.

The starting and the braking of the drum is not effected according to a predetermined function. It is therefore necessary to distribute the image points over  $300^\circ$  of the periphery of the drum, whereas the remaining  $60^\circ$  must be free of image points. This fact may be utilized to transmit the intervals between the individual characters. The clutch part 19 is stopped in this arrangement sooner than the drum 25. With the aid of a particular arrangement it is possible to transmit further signals as soon as the drum has come to rest.

In Fig. 6 is shown the distribution of the individual image points on the periphery of the drum for the character H. The first line from 28—29 which is scanned upon the starting of the drum is shortened to half the length of the lines; the following five lines 29—30 which carry the character elements have the normal length, whereas the last line 30—31 is again shortened.

The drive of the drum by means of a gearing is similar to the embodiment shown in Figs. 1 and 2 is accelerated and retarded according to a predetermined function. If in this case the individual image points on the transmitting drum have the same lengths, the image points are transmitted with different duration of transmission. When recording such a transmission with a standard receiver a distorted image is produced.

According to the invention the scanning member of the receiver is driven at the same non-uniform speed as the transmitting drum. By this measure a normal record of the characters is again produced. However, image points which are recorded with the same length are transmitted whose durations of transmission differ from one another.

With speeds of transmission which utilize the total band width necessary for the transmission, the transmission of characters of the same length whose periods of transmission differ from one another is unfavorable. Consequently, the differences in the duration of transmission resulting from the non-uniform speed of the drum are compensated according to the invention by the fact that the single lines and image points are arranged on the drum in a distorted manner. The distortion is effected to such a great extent in accordance with the known start and stop speed of the drum that the image points of equal length are again transmitted within equal durations of transmission.

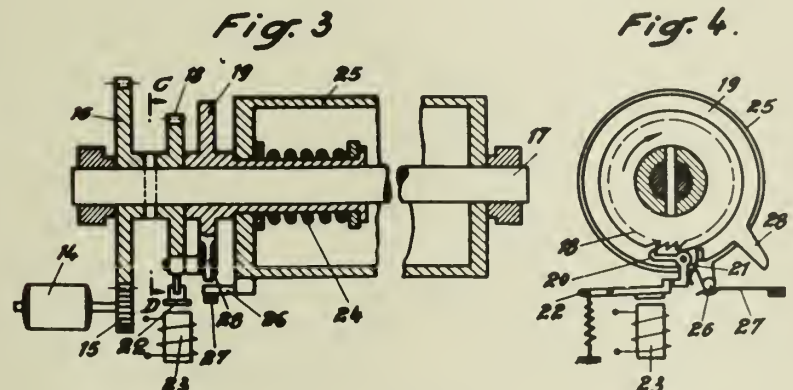
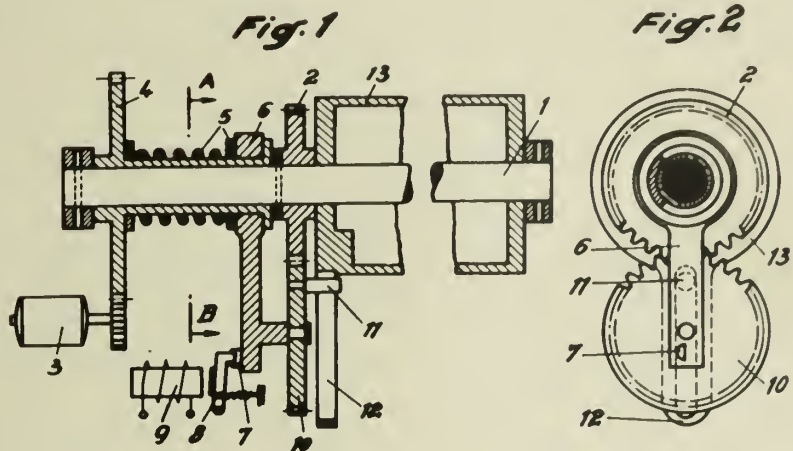
In Fig. 5 is shown for the embodiment according to Figs. 1 and 2 the necessary distortion of the lengths of the image points for the character H. Here the central line is longest, whereas the outer lines are more and more shorter. In such arrangements it is, of course, possible to employ as receivers, receivers of any suitable type. If a receiver is arranged with a continuously driven receiving member which is practically instantaneously started and stopped in a known manner there easily results an undistorted recording of the characters. If the receiving member is started at a given acceleration and retarded over an appreciable interval it is necessary to compensate the scanning of the scanning device in order to attain an undistorted record.

RUDOLF HELL.

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MAY 18, 1943.  
BY A. P. C.

R. HELL  
METHOD OF TRANSMITTING CHARACTERS BY  
MEANS OF REVOLVING DRUMS  
Filed Nov. 23, 1940

Serial No.  
366,932



Inventor: R. Hell.  
By Richardson and Sons  
Attys



# ALIEN PROPERTY CUSTODIAN

## PROPELLERS WITH VARIABLE PITCH

Nicola Bellomo, Bari, Italy; vested in the Alien  
Property Custodian

Application filed November 25, 1940

The present invention refers to a propeller with variable pitch of the epicycloid type, which has among other characteristics the one of being combined with a safety device with electric contacts, which is completed, where this is found necessary, by a system of mechanical block in order to impede that the blades reach dangerous positions.

The safety device is such as to be excluded only then, when flag-pitch or negative pitch is wanted, and it remains automatically inserted in any other case, even then when the control of the variations of the pitch is subjected to a regulator working in conformity with the number of revolutions of the motor.

The necessary energy may be supplied by a proper electric motor or it may be supplied by the motor itself which drives the propeller by means of electro-magnetic couplings.

In the attached drawing, which shows the subject of the invention in diagrammatic form, and just as an example:

Fig. 1 shows various sections of the control of the variations of the pitch and various sections of the hub, made in plans containing the axis of rotation of the propeller; the sections of the hub are made in such a way as to contain on one side the axis of a blade and on the other the axis of the endless screw 2 which drives the pinion 1 fit on the foot of the blade.

Fig. 2 shows in longitudinal section the actuating device with energy taken from the motor, which may be employed in substitution for the electric motor;

Fig. 3 shows the electric control scheme with safety device.

On the root of each blade, as in fig. 1, a cogged crown 1 is fastened, meshing with an endless screw 2 which again is fixed to a cogged wheel 3. The wheels 3—one for each blade—are all meshing with the wheel 4 which is coaxially loose on the hub. The wheel 4 is fixed on the train-support 5 to which two or more sun-wheels 7 are bolted.

To the train-support 6 which is in one piece with the hub, are bolted the sun, wheels 8 which have the same pitch-circle and are fixed with the same interest as compared with the axis of the hub of the sun-wheels 7.

The sun-wheels 7 and 8 mesh with the double crown wheel 16 which is coaxial and loose on the hub, furthermore the sun-wheels 7 mesh with the crown wheel 9 which is internally coaxial on the hub, but fixed, and the sun-wheels 8 mesh

with the crown 10 which is coaxial on the hub and has the same pitch-circle as crown 9.

The crown-wheel 9 is set moving when one desires to vary the pitch, otherwise it is still. It is provided with another external cogging which is coaxial to the hub 11 to which the movement of varying the pitch is transmitted by the wheel 12. To the purpose the wheel 12 is fixed to a helical crown 13 which is set moving by the endless screw 14 which is fixed to the shaft of the electric motor or to a shaft which may be set moving by the motor directly by means of electro-magnetic joints. To rotations of the screw 14 be it in one direction or the other are corresponding variations of the pitch, for each rotation of the crown 10 towards the fixed crown 9 determines a relative rotation between the train-supports 5 and 6, i. e. a relative rotation of the train-support 5 towards the hub, and therefore a rotation of the wheels 4 and 3, and finally of the blades.

The whole set is locked in a box 17 and lubricated by oil splash for which reason the seals 18 and 19 are set up. The seals 29 and 30 impede also the outlet of oil towards the electric safety complex which shall be described.

The control of the screw 14 may also be done, as we pointed out before hand, by energy taken from the motor as indicated in fig. 2. The shaft 55 controls the screw 14, and therefore it must rotate right or left when we desire to vary the pitch. The shaft 56 is set moving by the motor in any suitable way.

The conic pinion which is fixed to the shaft 56 drives the conic wheels 57 and 58, which are therefore, moved by contrary velocities. The shaft 55 ends in a grooved part 60 with which the disk 59 is engaged in such way as to offer a possibility of gliding axially and carrying the friction clutch or claw coupling 61. The shaft 68 of the disk may be axially controlled by the rod 63 through a double ball thrust bearing 62. To the rod 63 is fixed the disk 69, constituting the mobile armature of two opposed electro-magnets 64 and 65. The springs 66 and 67 return the disk 69 in the central position which is however shifting when it is attracted by one electro-magnet or the other, obliging the friction clutches 61 to engage with one wheel or the other 57 and 58 making thus the shaft 55 rotate clockwise or anti-clockwise.

The double ball thrust bearing 62 impedes the rod to follow the shaft 68 when the latter is rotating.

What has been described beforehand with

reference to fig. 2 as to how the necessary energy for varying the pitch should be taken from the motor itself has merely value as an example, for one essential characteristic of the present invention may be executed in any different way, differing from the one that has been described.

The shaft 32 of the wheels 12 and 13 prolongs itself by connecting with the flexible 33 which may drive a pitch-indicator which is provided with a multiplier that is placed in such a position as to be seen by the crew.

By means of a multiplier the wheels 12 and 13 move the disk with steps 24 of the blocking device and the drum 28 on which the sectors of the electric safety device are fixed.

As an example the multiplier is shown in the drawing of the epicycloid type and it is constituted by the sun wheels 21 and 22 which are linked with each other, and of the fixed wheel 20 and the mobile wheel 23. The wheel 20 meshes with the sun-wheels 21 and the wheel 23 which is yielding meshes with the sun-wheels 22. The proportion of reduction depends on the number of cogs of the wheels 20, 21, 22 and 23, and it must be fixed in such a way that at the maximum rotation which has been pre-arranged for the blades the yielding wheel 23 makes less than one revolution.

On the drum 28 is fixed, as in Fig. 3, a ring of conducting material 34 and three conducting sectors 35, 36, 37, which support the brushes 38, 39, 40, 41 that are connected with the electric driving circuit of the motor 42.

In Fig. 3 a disk is substituted for the drum 28, for the sake of clearness.

The ring and the sectors 31, 35, 36, and 37 are electrically connected among them. In Fig. 3 the motor is shown for continuous current with two fields for the movement in both directions and it is supplied by the battery or board-generator. On the disk 28 are indicated with  $d$  the radius of the disk which puts itself on the radius  $C$  on which the brushes are lined when the blades reach the maximum safety-pitch for the fly; with  $e$  the analogue radius for the minimum pitch; with  $f$  the analogue radius for the flag-pitch; and with  $g$  the analogue radius for the negative pitch.

The ring 34 is electrically connected with the negative pole of the battery. When the switch 44 is open, the negative pole of the battery is connected with the brush 45 of the motor through the sector 37 and the brush 41. In this way, work is interrupted when the maximum or minimum pitch is reached.

The hand drive of the motor is executed by means of a commutator 46 which acts upon the relays 47 and 48 (which may be reunited in a double relay) that again change the positive of the battery on one field or the other—49 and 50—of the motor. The automatic revolution-regulator 52 may be substituted for the commutator 46 when the switch 51 is closed, which works in the same way as the commutator 46, in relation, however, to the velocity of rotation of the motor, as is known.

The relays 47 and 48 come in contact with the negative pole of the battery through the sectors 39 and 35, and that is why one of them is excluded just before reaching the minimum or maximum pitch with automatically controlled working-system. In the case of the scheme of the drawing the relay 48 controls the increases of pitch and it is excluded when the maximum pitch is nearly reached.

The relay 47 controls the diminutions of the pitch and it is excluded when the minimum pitch is nearly reached. When one of the limits has been arrived at, the pitch cannot go on varying but it can turn backwards for the other relay has not been excluded.

In order to move a flag-pitch or negative pitch, the switch 51 must be opened so as to exclude the regulator 52, to close the switch 44 in order to exclude the safety sector 37, to invert the bonds 53 for which are substituted the hatched lines, and finally, to control with the commutator 46 the increase of pitch for flag-pitch and the decrease of same for negative pitch. Needless to say that all the said regulations may be executed by an operation with one grip on the dash board the pointer of which may assume various positions, and e. g., six positions: fixed pitch, increase of pitch, decrease of pitch, automatic working, flag-pitch, negative pitch.

In many cases the flag-pitch or the variable pitch are not asked for and the scheme is then simpler.

The angular development of the sectors 35 and 36 is such that after executing the reversion 53, the sector 35, which at first served as block for the maximum pitch now serves as block for the negative pitch, and the sector 36, which first served for diminishing the pitch by blocking it to the maximum pitch, now serves for increasing the pitch by blocking it to the flag-pitch.

The described electric scheme has only value as an example, for it can be realized with various modifications.

Besides the described electric safety device the mechanical block may also be added, which is constituted by the cylinder 25, as in Fig. 1, the bent tail of which is normally held by the circular step 24 rotating with the wheel 23. The circular step 24 is interrupted in conformity with the limit pitches and therefore once these positions are reached the spring 26 is pushing the cylinder 25 downwards so as to stop the step 27 which is fixed to the crown wheels 10 and 11.

The mechanical block is a further safety besides the one constituted by electric contacts lest the normal limit pitches of fly or one of them should be surpassed. It cannot be employed, or at least not without suitable controlling device where the flag-pitch and the negative pitch too are required.

NICOLA BELLOMO.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

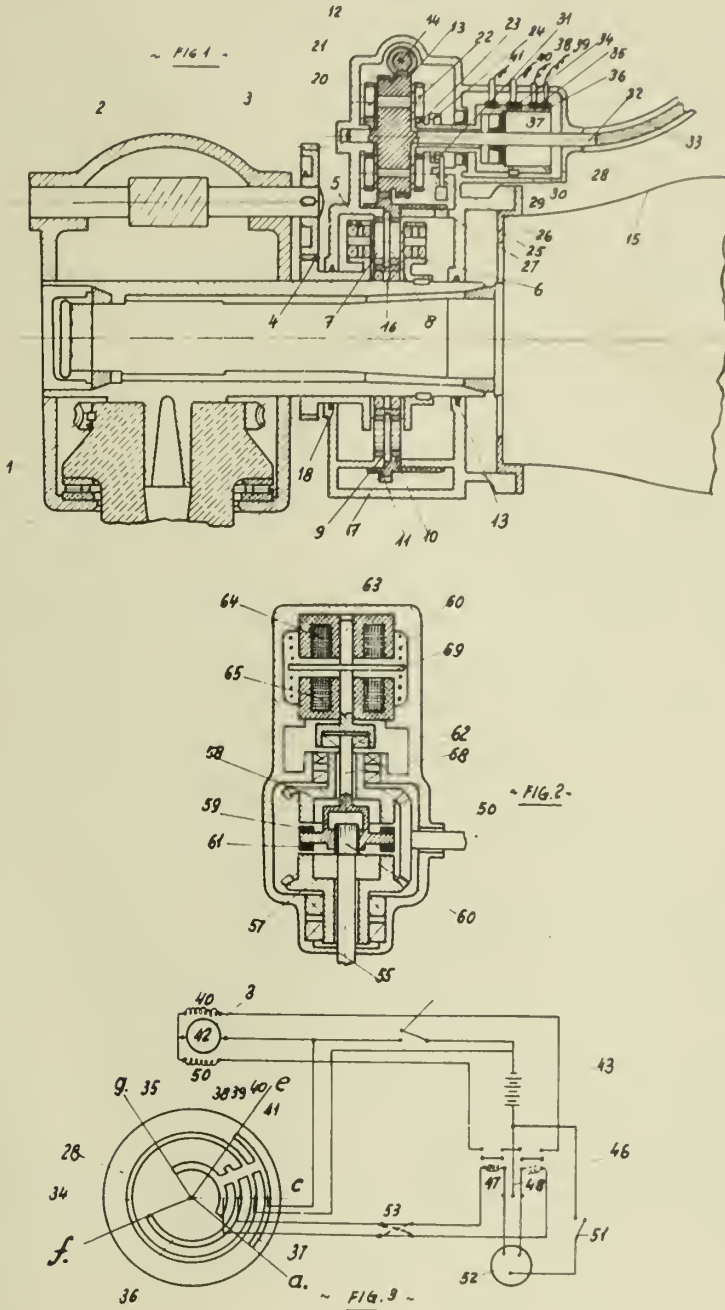
N. BELLOMO

PROPELLERS WITH VARIABLE PITCH

Filed Nov. 25, 1940

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Inventor  
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3341  
Young, Emery & Thompson  
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# ALIEN PROPERTY CUSTODIAN

## ULTRA HIGH FREQUENCY CABLES

Karl Kohl, Berlin, Germany; vested in the Alien  
Property Custodian

Application filed November 26, 1940

For transmitting currents of high frequency, so-called Lecher-wires have proved to be advantageous. These consist of wires or concentric lines running parallel with small spacings between the wires. A disadvantage of these lines is their comparatively large mutual capacity as well as the always existing residual radiation and the self attenuation of the lines.

Contrary thereto, the present invention relates to a construction of an ultra high frequency cable distinguished by a particularly small attenuation and, therefore, by a long range. The cable according to the invention is constructed as a hollow conductor for transmitting a free spatial radiation, and there are provided transverse conductors with so small mutual spacings that the transmitted ultra high frequency radiation is prevented by diffraction from entering the spaces between the transverse conductors. The dimensions of the transverse conductors are preferably chosen so that a resonance or an optimum freedom from attenuation is obtained for the wave length transmitted. As transverse conductors there may be used walls of metal or metallized material. Preferably these walls have a circular or annular shape.

A constructional example of the invention is illustrated in the accompanying drawing which shows a hollow cable with conductors 1 and 2, each being completed by transverse conductors 3, 4, facing each other. The free ends of the

intermediate conductors approach each other up to the short distance  $d$ , which is made as small as possible in order to avoid radiation losses. Also the distance  $e$  between two adjoining transverse conductors is small, at least small enough to avoid a diffraction of the radiation about the free ends of the transverse conductors with the wave length employed. There is an optimum value for the length of the transverse conductor, at which the latter or the whole line is just in resonance and thus possesses the extreme freedom from attenuation for the ultra short waves transmitted.

The transverse conductors may be constructed as walls of metal or metallized material and may have a circular or annular shape. The partitions are connected directly with the concentric longitudinal conductors 1, 2.

For the transmission of a free spatial radiation it is advisable to make the free inner diameter  $d$  equal to  $\frac{1}{2}\lambda$  or equal to even or uneven multiples of  $\frac{1}{2}\lambda$ .

The wave radiated into the free inner space from one end is kept together by the conductive covering with the transverse walls 5. The entire arrangement acts as a radiation director.

The invention is not restricted to the constructional example illustrated, but is also applicable in the case of cables of other construction, for example in a cable with two conductors.

KARL KOHL.



PUBLISHED

MAY 18, 1943.

BY A. P. C.

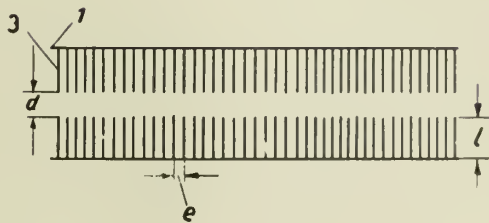
K. KOHL

ULTRA HIGH FREQUENCY CABLES

Filed Nov. 26, 1940

Serial No.

367,195



INVENTOR  
Karl Kohl

BY *Henry V. L...*  
HIS ATTORNEY



# ALIEN PROPERTY CUSTODIAN

## CYCLONES

Hermannus van Tongeren, Heemstede, Netherlands; vested in the Alien Property Custodian

Application filed November 26, 1940

A cyclone usually comprises a substantially cylindrical casing merging, at its lower end, into an inverted conical part provided with a bottom outlet for the dust, said casing having in its top wall a cleaned gas outlet and in its cylindrical wall a tangential dust-laden gas inlet nozzle of substantially rectangular cross-section.

Hitherto said inlet nozzle has been so arranged that either its flat side wall facing the cylindrical casing, or its opposite side wall extends unto the line where it meets the cylindrical wall of the casing, as indicated in cross-section in Fig. 1a and in Fig. 1b, respectively of the annexed drawing. Intermediate forms are also often found in practice. In all these constructions, that flat side wall of the inlet nozzle, which faces the cylindrical casing, forms together with the adjacent part of the casing, a sharp wedge designated by K in said figures.

In accordance with my present invention, said wedge is truncated, for instance along a plane passing substantially through the axis of the

cylindrical casing, so that the radial length of the wall portion interconnecting said nozzle wall with the cylindrical casing is at least one tenth, and preferably at least two or three tenths of the radius of the cylinder.

Figs. 1 and 2 are a side elevation and a cross-section along the line II—II in Fig. 1, respectively, of a cyclone constructed in accordance with this invention. The aforesaid wall portion is designated by S. The length  $a-b$  here is about  $0.2\ b-c$ .

Truncating the wedge as described does not or not appreciably affect the efficiency of the dust separation, but it considerably reduces the resistance of the cyclone, whose capacity is thus increased as compared with that of an equally sized normal cyclone.

Instead of being truncated along a plane, as illustrated in Fig. 2, the wedge may be truncated along a more or less cylindrical surface.

HERMANNUS VAN TONGEREN.



PUBLISHED

MAY 18, 1943.

BY A. F. C.

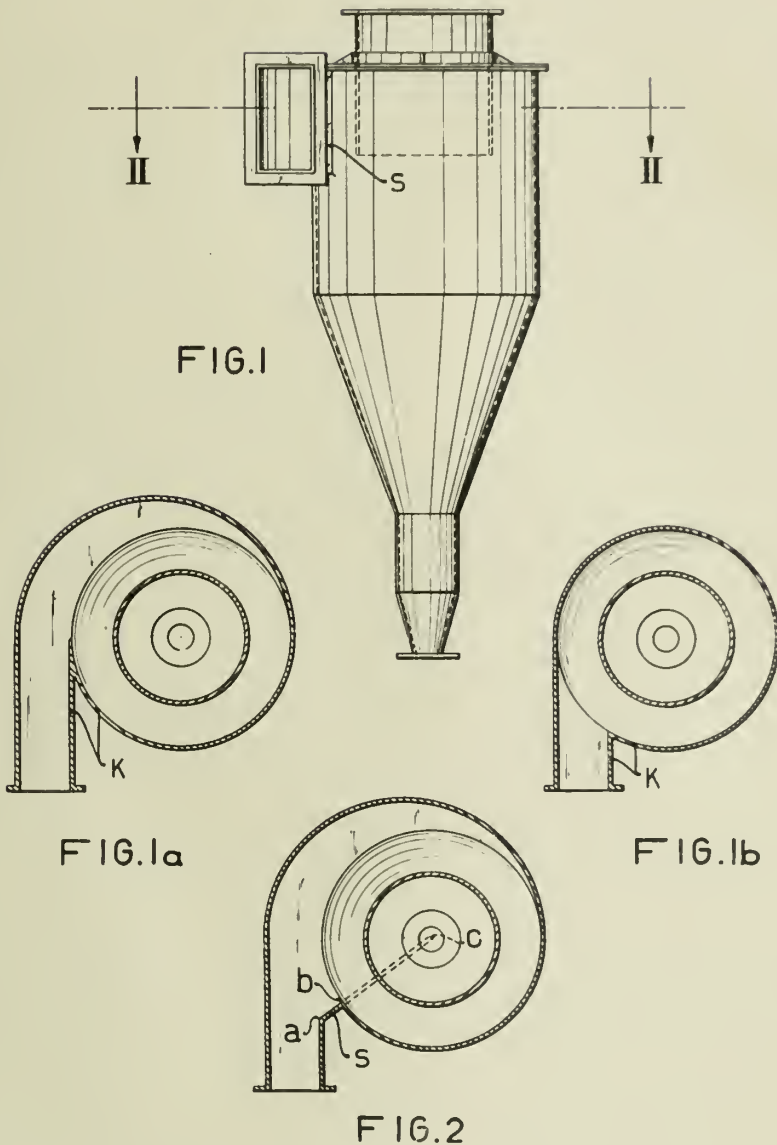
H. VAN TONGEREN

CYCLONES

Filed Nov. 26, 1940

Serial No.

367,293



INVENTOR

HERMANNUS VAN TONGEREN

By *Wachsmuth & Hoff*  
Attys



ALIEN PROPERTY CUSTODIAN

PROCESS OF PRODUCING BIOS- AND ALBUMEN-PREPARATIONS

Felix Grandel, Emmerich/Rhein, Germany;  
vested in the Alien Property Custodian

No Drawing. Application filed November 26, 1940

It is already known to exercise an intensifying effect upon fermentation, especially upon yeast fermentation in the case of carbohydrates, by alcoholic extracts from germ- (embryonic) parts of vegetable seeds and also from any products resulting from the processing of seeds and fruits, e. g. bran of germs, and containing germs (embryonic parts).

A process is, moreover, known of accelerating the growth of yeast in the preparation of compressed yeast by admixing substances containing completines, when using a nutritive solution poor in completines of the fission of cells, characterised in that the optimal quantity in the case of a given nutritive solution, and the concentration of the substance to be admixed respectively, are determined by way of a previous test.

It has now been found that Bios and albumen preparations of high quality can be obtained by the saccharification of vegetable substances rich in starch and albumin, e. g. oleaginous fruits, resting germs from vegetable seeds (germs of wheat, rye, maize and the like), and the residues left after pressing or extraction in the process of oil preparation, after the cellular structure has been previously broken up by steaming, preferably at an increased pressure, or in vacuo, or by colloidisation, and the like, e. g. by the enzymatic method. The saccharification can, in the place of the enzymatic method, also be brought about chemically, e. g. by a mineral acid, and the preceding treatment with steam be carried out in such a way that the dextrination of the starch contained in the original material is carried out under pressure, or in vacuo. The substances dissolved in water, such as the sugar formed from starch, Bios, albumin, mineral salts and other concomitant substances, are separated out by decantation, filtration or centrifugation, and are boiled down in vacuo, after they have been previously acidified with lactic acid bacteria, if necessary, (in order to increase the durability and to improve the clarification of the solution).

The inspissation of the solution rich in Bios is preferably performed in a vacuum circulation-evaporator, the interior surface of which is coated with glass-enamel, adsorbents and the like being added in order to decolorize the aqueous extract. The technical Bios concentrate thereby obtained shows qualities similar to those of malt extract. The optimal effect of the preparation is preferably to be ascertained under the Enders and Hegendörfer method, *Biochem. Zeitschrift* 298, 16 (1938), for which test certain races of yeast,

which are poor in bios, are used as a comparative test, and nephelometry is made use of.

The insoluble residue chiefly consisting of albumin and in certain cases lipoids, is washed so as to become free of sugar, after having been separated out, and is then dried, after substances (as for instance ammonia, tartar, sodium bicarbonate, and the like), which improve the effervescence and fermentation power pigments (egg colours), substances correcting the odour and flavour (Vanilline, kitchen salt, etc.) have been added, this drying process preferably to be carried out in an atomization-dryer. If substances containing lipoids (fatty ingredients) are used as primary substances, the powder obtained will be highly similar to dried natural fowl's eggs, whereas primary substances free of lipoids (ingredients free of fat) and containing albumin and starch, will supply a substance adapted to use as a substitute of ovalbumen. The albumin preparation will help to save real hen's eggs in bakeries, confectioner's plants, biscuit and chocolate factories and for household purposes.

The substances activating fermentation which are obtained under the processes known up till now, will never be exactly defined, whereas the products prepared in accordance with the process under the present invention will be biologically tested preparations defined by the term "Bios".

The new process is simple and can also be practised at a larger scale and for technical purposes.

Examples

(1) 100 kg of wheat germ cake are extracted with benzene and finely ground. The powder of wheat germ cake shows about the following composition:

	Per cent
Water.....	9.81
Protein.....	29.68
Fat .....	1.49
Extract substances free of nitrogen .....	52.02
Raw fibre .....	2.52
Mineral substances.....	4.48

After separation of the bran components the powder is prepared by stirring it upon admixture of 3 to 4 times as much of water, and heated for one hour up to 100 centigrades, steam being fed thereto. After having been cooled down to 55-60 centigrades, the quantity of diastase required for the saccharification of the starch contained in the quantity of wheat germ cake concerned is added as an extract of green malt prepared by way of extraction of crushed green malt with a

quantity of water being three to four times as great, whereupon the mash is for four hours kept at the temperature (55 to 60 centigrades) necessary for saccharification. After the saccharification has been completed, the sugar solution is separated by decantation, filtration or centrifugation from the material which is new free of starch. After having been acidified with lactic acid bacteria, if necessary, the solution is concentrated in vacuo so as to have the consistency of sirup. This sirup will contain 43% of sugar, 5% of ashes and 7.5% of albumin, reduced to dried substance, and shows an optimal Bios effect, if 1 to 5% of it,—as compared with the quantity of pitching yeast—are used. The powder free of starch which will be left after separation of the sugar solution, is dried by way of atomization, after having been thoroughly washed with water. The composition of this atomized powder is approximately the following:

	Per cent
Protein .....	70
Sugar .....	8
Ashes .....	3
Water .....	6
Extract substances free of nitrogen .....	13

This powder, which is rich in albumin, can be used as a substitute of dried albumen of fowl's eggs, after having been treated with ammonia and tartaric acid, if necessary, in order to improve its effervescing capacity.

(2) 100 kg of wheat germ cake having about the following composition:

	Per cent
Water .....	12.69
Protein .....	27.82
Fat .....	5.08
Extract substances free of nitrogen .....	47.75
Raw fibre .....	2.41
Mineral substances .....	4.25

are in a colloidal vibration-mill ground down to colloidal fineness with about three to four times as much of cold water, are then pre-saccharified with the quantity of diastase contained in the quantity of wheat germ cake concerned (about 100 to 250 D. K.) at a temperature of 40° to 50° centigrades, whereupon they are further saccharified at 50° to 60° centigrades by an admixture of 0.7% of "Tectil" malt extract with 12000 D. K., until the iodine-starch reaction shows a negative result. After separation and evaporation of the sugar solution one will obtain about 60 kg of extract, representing the desired Bios concentrate. The optimal effect of this extract is similar to that of the Bios preparation made in accordance with example 1.). 0.08% of egg colour, 1% of kitchen salt and 0.3% of vanillin are admixed to the saccharified powder, which is then atomized in a drying tower. The powder thus obtained shows about the following composition:

	Per cent
Albumen .....	50
Fat .....	10
Ashes .....	6
Sugar .....	8
Water .....	10
Extract substances free of albumen .....	16

As the composition of this powder is similar to

that of dried real hen's eggs, it can be used as a vegetable dried natural egg substance.

The Bios preparations made under the new process are excellently adapted to be used for fermentation purposes.

So, for instance, the technical Bios concentrate, can be used advantageously for baking purposes, both for dough fermented with leaven and dough fermented with yeast. The quantities of Bios contained in the extract render a considerable reduction of the fermenting period possible in particular during the last period of the dough's fermentation, this reduction resulting in savings with regard to both heat and working time. The reduction in time required for fermentation will in certain cases cause a reduced decomposition of the gluten by proteolytic enzymes, but this can easily be made up for by mechanico-dynamic swelling. The fermentation of the dough will furthermore also be expedited by the high percentages of sugar and albumin substances contained in the Bios preparation. One will, more particularly, proceed in such a way that those quantities of Bios concentrate, as will be shown by the result of the test to be necessary for an optimum of yeast fermentation, are added to the dough water. This quantity will be from 1.5 to 3 percent.

In the brewing industry a delayed fermentation causing an increase of the danger that an infection of the yeast is brought about, will easily take place, in particular in such cases, where, as customary abroad, the malt to be used has been eked out by means of malted maize and rice and the like materials. If the Bios preparation made under the new process is admixed to the fermentative mixture prepared, a quicker course of the fermentation process is brought about, and an infection of the yeast prevented.

In distillery plants (cereal grains, whisky, gentian distilleries, etc.) the use of the new Bios preparation offers great advantages due to an increase in efficiency of the already existing fermentation equipment. By the reduction of the time required for fermentation, which is brought about in such a way, the output of these plants can be very considerably increased.

Particular advantages are implied in the use of the Bios preparation for purposes of the yeast industry, where in addition to the reduction of the time required for a correct fermentation process an increased yield is also brought about. One will, moreover, be successful in preparing yeast on the basis of molasses, such yeast being perfectly equal to grain yeast of the highest quality.

In all of these processes the use of such Bios preparations, as have been made under the new process, will involve great economical advantages. In consequence of the shortened fermentative period, the expenses for power and working time will be reduced, whereas it will be possible at the same time to increase the output. Such yeast, to which Bios has been admixed, will, moreover, show a better capacity of resistance to the danger of infection, as compared with a yeast poor in Bios. These facts clearly establish the advantages involved in the use of Bios by such industrial branches, as avail themselves of processes of fermentation.

FELIX GRANDEL.

# ALIEN PROPERTY CUSTODIAN

## PROCESS OF PREPARING PENTONE ACIDS AND THEIR SALTS

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No Drawing. Application filed November 26, 1940

The subject matter of the present invention is a process for the preparation of pentone acids by transforming pentoses, such as arabinose, xylose, ribose and lyxose by means of oxidation into the corresponding I-carbonic acids and the salts of same with the aid of bacteria of the acetobacter, mucor or aspergillus families, and the further processing of the compounds thus prepared, in order to obtain under already known processes wholesome salts of the pentone acids for pharmaceutical purposes.

It is already known to electrochemically prepare the corresponding acids from sugars by way of their oxidation, availing oneself for this purpose of bromide of potassium and carbonate of calcium. The further processing of the substances thus obtained is, however, very difficult in view of the presence of bromide of potassium. It is also already known to transform glucose on bacterial methods by means of acetobacter, aspergillus bacteria or mucoraceae into gluconic acid, the salts of which then can be kept free of harmful admixtures. It is, however, not yet known to work pentoses in this manner. This will most probably be due to the fact that the biological characteristics of pentoses are perfectly different from those of hexoses. Whereas, for instance, hexoses are quickly and thoroughly fermented by baking yeast, such a fermentation does not take place in the case of pentoses.

It has now been found that pentoses upon intense aeration are attacked by hyphomycetes of the aspergillus, mucor and acetobacter types, and in particular by acetobacter suboxydans, in which cases concentrations of 20% are oxidised so as to furnish a 98% yield of the corresponding pentone acids which, after having been neutralised by an addition of metallic carbonates or basic metal salts, can be immediately used as liquids for injection in metal therapeutics.

As sufficient quantities of pentoses are at disposal in the wood saccharification industry, where they are produced as intermediary extracts from the wood of deciduous or coniferous trees, the new process possesses a particular technical importance.

The use of pentone acids in the place of hexone acids for pharmaceutical uses implies particular advantages. Already for a long period of time experiments have been made in order to render the non-readily soluble salts of the polyoxycarbonic acids, e. g. Ca-gluconate, suitable for injections as supersaturated aqueous solutions containing a high percentage of said salts, but not being inclined to crystallise. A great number of compounds has been suggested as stabilisers for this purpose, but an ideal solution of this problem has not been found in this manner.

The present invention is based on the discovery that the salts of the pentone acids are much

more readily soluble in water, and that the salts of the earthy alkalines cannot be caused to take on a crystalline form, even at the highest possible rate of concentration. It is furthermore to be taken into consideration that in consequence of the lower molecular weight of the pentone acids the contents of metallic ions are comparatively higher than for instance in the case of the hexone-acid salts. Only small quantities are therefore used for injection, whereby a subcutaneous application, which always is aimed at, is rendered possible without thereby causing pains at the place of injection.

The aqueous salt solutions of the pentone acids prepared by the bacterial method under the process of the present invention, can be immediately used for injections, after they have been purified with active coal in a heated condition, and after a subsequent sterilization.

As a matter of course it is also possible to prepare solutions for purposes of injection, which show an even higher degree of purity. So, for instance, the pentone-acid salts can be isolated in a pure condition, by a precipitation from the thoroughly fermented sugar solutions with organic solvents, e. g. methylic alcohol, and by a reprecipitation, if necessary, whereupon they are dissolved in water at the desired rate of concentration.

### Example

750 g. of crystallized xylose are dissolved in 5 litres of water with an admixture of 0.05% of a nutritive salt solution consisting of 33% of  $(\text{NH}_4)_2\text{SO}_4$ , 33% of  $\text{KH}_2\text{PO}_4$ , 12% of  $\text{Ca}(\text{NO}_3)_2$ , 12% of  $\text{MgSO}_4$ , 0.2% of  $\text{FeCl}_3$ , and the solution thus obtained is aerated in a suitable vessel by fritting. Thereupon a suspension of acetobacter suboxydans in water is admixed, and quantities of  $\text{CaCO}_3$  added in the course of the testing period in accordance with the reduction of the sugar index figure. After the xylose concentration has been reduced to a lower percentage than 0.1%, the solution is filtered, and at a heated condition boiled for 30 minutes with 5% of active coal ("Norit"), filtered again and by dilution adjusted so as to show 20% of Ca-xylo-nate (Yield: 98%). This solution can after its sterilisation immediately be used in metal therapeutics for intramuscular, subcutaneous or intravenous injections.

A portion of the liquid which is clear like water, is fed into cold methylic alcohol, filtered in the cold condition, this operation being repeated after the residue has been dissolved in water. The residue which is now very fair, is dissolved in water so as to furnish a 50% Ca-xylo-nate solution, which continues to be perfectly limpid even after having been kept for a prolonged period of time, just as the residue not having been re-purified.

FELIX GRANDEL,



# ALIEN PROPERTY CUSTODIAN

## MANUFACTURING SELENIUM CELLS

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in the Alien Property Custodian

No Drawing. Application November 27, 1940

In the manufacture of selenium cells, as dry rectifiers and photo-electric cells, the practice has been to proceed as follows. Selenium is welded onto a hot metallic base plate which, for instance, is made of a metal of the iron group and is heated to about 300° C. After this assembly has become cold the selenium is an amorphous layer firmly united with the base plate. Between the selenium structures so obtained mica discs and discs of a suitable elastic material are interposed in a suitable stacking device, the mica discs being arranged to contact with the selenium layers. The stack so produced is then compressed by spring-actuated means of the stacking device.

The stacking device with the selenium structures and intermediate discs contained in it is now heated in a formation furnace to about 150° C. The selenium layers are thereby transformed from the amorphous condition into the crystalline condition. This forming process takes several hours and is stopped after the desired degree of formation has been attained.

At the commencement of heating, the amorphous selenium layers soften. Inequalities and bubbles in these layers will be removed by the elastic discs acting to distribute the pressure of the spring-actuated means uniformly over the selenium layers. The selenium layers crystallize and thus harden again. After finishing this forming process the selenium structures are removed from the stacking device and subjected to a second forming process. The temperature employed in the case of such second process is higher than in the former case. The duration of the second process, however, is shorter than that of the former. By the second process the selenium layers are completely transformed into the metallic condition, in which they are well conductive in the traversing direction of the cell.

It has also been proposed that amorphous selenium be applied to the metallic base plate by pressing it cold thereagainst. For this purpose selenium powder is arranged on the base plate and fixed to it by a high pressure. The two said forming processes are then employed as in the case before.

These methods have the drawback that several hours pass away until the selenium layers have been finished. Also, during the first said forming process, which is of long duration and involves the use of a high temperature, the selenium layers should be prevented from contacting with a metal because traces of such metal may be able to penetrate into the selenium

layers so as to increase the return current of the valve and to prevent a proper blocking layer from forming at the surface of the selenium. Therefore, care should be taken that during this process the selenium layers only contact with the said neutral mica discs, which in their turn should be carefully cleaned, every time they have been used.

As regards methods which comprise the step of welding selenium onto the base plate this step is time-wasting and much depends upon the skill of the workman, thus constituting a disadvantage that has to be contended with in addition to the long forming period.

All these drawbacks are overcome by the following method.

Amorphous selenium is applied to the cold metallic base plates which preferably are roughened. The selenium is applied thereto either as a powder or in the form of thin pressed plates calculated to cover the base plates. The base plates so provided with selenium are placed on the table of a press. This table and the die of the press are heated to about 200° C. and are maintained at this temperature. Preferably, a self-regulating electric heating apparatus serves this purpose. The structures comprising base plate and selenium and located on the hot table are now highly compressed by means of the hot die. The heat and the pressure to which the selenium is in this way subjected act to firmly unite the amorphous selenium layer with the base plate and at the same time to transform it into the grey crystalline condition. The pressure on base plate and selenium is so calculated that the forming process shall be finished as quickly as possible at the said temperature. This temperature should not be substantially exceeded since otherwise the selenium layer would melt. With a suitable pressure employed in this regard the pressing and forming process will have been finished after about 30 seconds. A selenium structure manufactured in accordance with the invention, in the state it has been removed from the press, corresponds to the structure obtained by means of the said first forming process. Thus, the known method taking several hours is replaced by a method that takes a number of seconds only.

In addition to such saving of time the output of the selenium structures so obtained is better and above all is much more uniform than previously, this advantage being due to the fact that mechanical operation has been introduced to replace in part manual labour.

Another advantage is that the said discs of electric material as well as the mica discs may be dispensed with. The elastic discs, which serve to equalize the pressure exerted on the uneven surface of selenium layers produced by manual labour alone, are not needed because the surface of selenium layers as produced by the novel method is uniform throughout. Equally, mica discs need not be arranged to contact with the selenium layers, as the time during which the hot pressing die is contacting with a selenium layer is too short to enable detrimental quantities of metal to enter this layer.

Preferably that surface of the die by which it contacts with the selenium is highly polished in order that the selenium, transformed into the crystalline condition, shall readily come off from the die. Furthermore, the die may be coated with hard chromium or another suitable metal with a view to obviating chemical reaction between selenium and die.

The novel method also renders it possible to

provide a selenium layer which is thinner than in prior devices without being less rigid. Its thickness may be less than 0.1 mm, whereby the ohmic resistance in the traversing direction of the cells will be considerably reduced, this being highly important in the case of dry rectifiers.

The selenium structures so manufactured are then finished in well-known manner, that is to say, the selenium is subjected to the said second thermal forming process, known from the prior methods. In special cases such second forming process may be dispensed with. The desired selenium cells are thereupon obtained by adding the so-called counterelectrode. In the case of rectifiers the counterelectrode is a metallic layer produced by spraying metal onto the selenium layer, while in the case of photo-electric cells such electrode is a light-permeable metal film produced on the selenium by the so-called cathode sputtering.

HEINRICH HERRMANN.

ALIEN PROPERTY CUSTODIAN

DEVICE FOR MEASURING VOLTAGES OR  
INTENSITIES IN VERY LOW POWER CIR-  
CUITS

Armand Glorie, Paris, France; vested in the Alien  
Property Custodian

Application filed November 29, 1940

The present invention has for object a device allowing to measure with all the desired accuracy the voltages or intensities existing in circuits in which the available power is extremely low, owing, either to an extremely low electromotive force, or to a very high resistance or impedance.

These measurements generally give rise to difficulties arising from drops of voltage due to the insertion of the measuring apparatus in the circuit in question, these drops of voltage alter the measurements, unless the relative resistances or impedances of the main circuit and of the secondary circuit created by the insertion of the measuring apparatus are taken into account. They are also usually altered by the lack of sensitivity of the instruments.

As the measurement of an intensity always comes to the same thing as measuring a voltage, the device according to the invention is described in the case for the measurement of voltage only, the same system being applicable to measurements of intensity by modifying it according to the usual process of the art.

The system under consideration essentially consists in utilising a valve amplifier, but in combining it so as to avoid the inconveniences of amplifiers usually used, and in particular their instability, their lack of proportionality between the input and output voltages, which inconveniences arise, for the greater part, from the grid leak.

For that purpose, according to the present invention, in the case of direct voltages, the magnitude to be measured is transformed before entering the amplifier into an alternating voltage of the same maximum value and of such a frequency that, by the action of band filters, it can then be easily separated from the alternating voltage arising from the grid leaks of the valves of the amplifier or from the alternating voltage introduced in the circuit by capacity or induction, which voltages have the frequency of the current supplied to the valves. The frequency of the modulated voltage can be higher or lower than that of the circuit feeding the valves, but it must be clearly different therefrom.

The apparatus modulating the voltage to be measured can be, either a three electrode valve, or a mechanical contact-breaker, but it must always be such that it simultaneously allows of synchronously rectifying the output voltage of the amplifier, in such a manner that it maintains the direction and the magnitude of the input voltage.

According to another feature of the invention, the amplifier is connected so as to amplify, not the voltage to be measured, but the difference between the voltage to be measured and the voltage at its output terminals, the amplification from one valve to the other taking place posi-

tively for the modulated frequency (that is to say by reaction), and negatively for the feeding frequency of the valves (that is to say by counter-reaction) the amplification coefficient of the amplifier being chosen in such a manner that within the error admitted for the measurement, the output voltage of the amplifier is equal to the voltage to be measured.

The figure diagrammatically illustrates an embodiment of the present invention.

The negative pole of the voltage to be measured E is connected to the terminal 1, and its positive pole is connected to the terminal 2; the negative pole of the voltage read E' is connected to the terminal 6 and its positive pole to the terminal 7; the positive terminals of E and E' being connected together.

A double synchronous reversing switch 4 and 8 effects the following operations, successively in the time and at the frequency chosen for producing alternating current.

It simultaneously connects, on the one hand, to the terminal 1, the input condenser 5, connected in its turn to the amplifier 3 and, on the other hand, to the terminal 7, the output condenser 9.

In the following time, it respectively connects the condensers 5 and 9 to the terminals 11 and 6, then it begins the cycle over again.

A condenser 10 of high capacity is interposed between the output terminals 6 and 7 for avoiding oscillations of the rectified voltage.

When the double reversing switch connects the terminal 1 to the condenser 5 and the terminal 7 to the condenser 9, condenser 5 receives a charge which is proportional to the difference of potential E-E', and which producing on the amplifier the effect of a half-period of alternating current, charges, through the medium of said amplifier, the condenser 9 with a charge equal to  $n$  times that of condenser 5 ( $n$  being the amplification coefficient of the amplifier); in the following time, the reversing switch being on the contacts 11 and 6, condenser 5 is discharged by short-circuiting and condenser 9 brings its charge to condenser 10; the cycle can then begin again.

The grid leak of the amplifier, altering the reading E', cannot intervene, since E' constantly tends to be rendered equal to E; likewise, the variations of the amplification coefficient of the amplifier are eliminated, as they only intervene for causing the difference between E and E' to vary, which difference is only a fraction of E and equal to E divided by the amplification coefficient. Sufficient amplification therefore allows of reducing to an infinitesimal quantity the variations arising on this account.



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MAY 18, 1943.

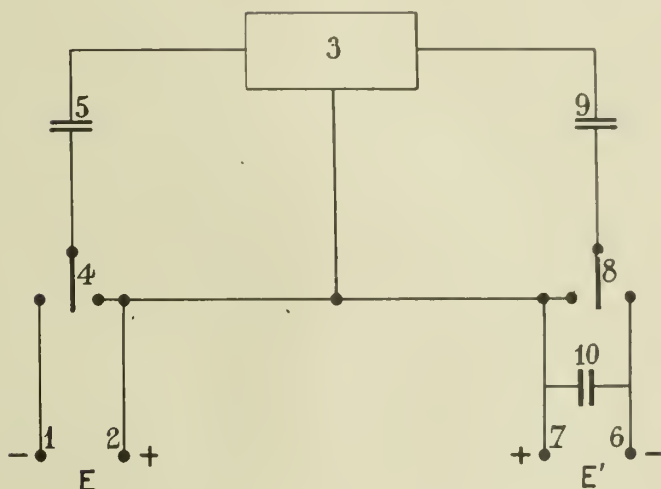
BY A. P. C.

A. GLORIE

DEVICE FOR MEASURING VOLTAGES OR INTENSITIES  
IN VERY LOW POWER CIRCUITS  
Filed Nov. 29, 1940

Serial No

367,866



Inventor,  
*A. Glorie*

By: *Glascoep Downing*  
*Hays*



# ALIEN PROPERTY CUSTODIAN

## TRANSMISSION LINE

Hans Jakob Ritter von Baeyer, Hans Otto  
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many; vested in the Alien Property Custodian

Application filed November 30, 1940

To suppress the so-called shell waves traveling along the outer conductor of shielded radio frequency lines or cables the use of "stopper pots" or traps has been suggested in the prior art. These essentially consist of a metallic cylinder of  $\lambda/4$  length surrounding the outer conductor and unilaterally connected with it. Where relatively long waves are dealt with the geometric dimensions of these traps turn mostly out to be so large that constructional difficulties arise. It is, moreover, desirable in many instances to insure an excluder or suppressor action only at a single point and to alter the line as little as possible otherwise. To the said end, according to the invention, a concentrated or lumped capacity is used with the trap, with the result that the other dimensions of the excluding structure are diminished to such an extent that the geometric proportions of the excluding trap become far less than  $\lambda/4$ , indeed, they can be reduced practically to any desired extent.

There are quite a number of different ways and means adapted to carry the basic idea of the invention into effect, and some of these shall be hereinafter described by reference to the appended drawing which shows several exemplified embodiments.

Figure 1 shows a coaxial line L. The inner conductor thereof terminates in an antenna A. In order to avoid waves travelling along the shell or outer conductor, a trap is provided at a distance of  $\lambda/4$  below the end of the outer conductor as indicated at T. This trap essentially comprises a concentrated or lumped capacity C and a small cup-shaped part S. By shifting the said part S having a capacitive flange, it is possible to tune the trap. This arrangement still carries current on the top face of the upper capacity flange from the line (arrow), and this current is suppressed to zero value only at the entrance end of the trap, that is to say, on the outer edge. If, also, this current is to be suppressed, and if a current anti-loop or node is to be established directly at the conductor, then the arrangement shown in Figure 2 will prove of greater advantage in which the input of the trap circuit is arranged directly on the conductor surface or in such a way that no currents of the kind mentioned in connection with Figure 1 are able to arise. As to the rest the embodiment Figure 2 in all essential details corresponds to that shown in Figure 1.

Figure 3 shows at the same time various ways of designing the suppressor pots or traps comprising lumped capacity. The upper pot or trap con-

sists of an annular hollow body or chamber which is fitted with capacity flanges and which either is shifted directly on the line L or which surrounds the line while being spaced apart therefrom a distance that is small compared with the wavelength. The trap is, in the latter case, entirely separated from the transmission line and is readily shifted therefrom. The traps in the upper portion of Figure 3 amount to substantially a single turn toroid having a flange shaped concentrated capacity for tuning. If this circuit is to be made tunable, then recourse may be had to the embodiment of a trap shown further below. In this embodiment the ring comprises two parts being shiftable in each other. The trap shown at the bottom of Figure 3, finally, is merely a symmetrical modification of the trap of Figure 1.

The selectivity of the traps described is substantially greater than that of the stopper systems of  $\lambda/4$  known in the art inasmuch as inductance and capacity no longer are uniformly distributed, in fact, merely a capacity is practically involved which, even with slightest changes occasions a substantial change in the tuning. By resorting to suitable screw construction, it is an easy matter to insure the desired accuracy of tuning. If an entire frequency band or a number of frequencies are to be excluded rather than a single frequency, then a plurality of traps tuned to different waves may be mounted in sequence. This is illustrated by way of example in Figures 4 and 5. The embodiment, Figure 4, comprises a joint and common capacity plate C which conjointly with the various traps T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> allows to build a geometrically reduced trap or stopper systems designed for three frequencies. It will be obvious that also in this embodiment the drawback described by reference to Figure 1 can be avoided by choosing a suitable form of construction along the lines of embodiment Figure 3, if the excluder action is to be insured directly on the conductor. Figure 5 utilizes the type of trap shown at the top in Figure 3 so that no further explanation is required.

The tuning and the properties of the trap or pot circuits may be acted upon and regulated at will by filling the same with materials possessing convenient dielectric constants, permeability and conducting powers. In fact, a medium inhering adequate loss may here serve at the same time to directly attenuate and suppress the wave to be eliminated. In an embodiment of this kind, for instance, a hemp rope may be wrapped or braided with wires in such a way that two semi-cylindrical cups placed opposite each other are

formed. This rope being tuned to resonance by its diameter may be wrapped around the conductor to be rid of radio frequency waves thus resulting in an arrangement resembling that shown on top in Figure 3, though with this distinction that a substantial ohmic drop is occasioned. A further modification involves a lumped capacity connected across the ends of a toroidal coil surrounding the transmission line. The toroidal coil may be conveniently constructed by lacing a conductor around a wooden ring adapted to be placed over the transmission line.

The invention is not confined to the purpose of eliminating or suppressing what has briefly been called "shell" waves, in fact, it can be used also to suppress waves of definite frequency on any kind of conductor at all. From other constructions known in the prior art it distinguishes itself especially by its extremely reduced geometrical proportions.

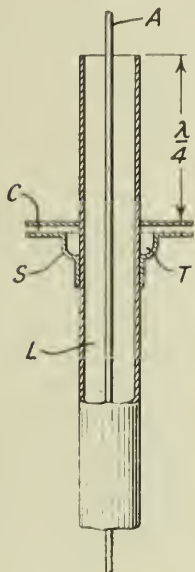
HANS JAKOB RITTER VON BAEYER.  
HANS OTTO ROSENSTEIN.  
FRIEDRICH TISCHER.

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BY A. P. C.

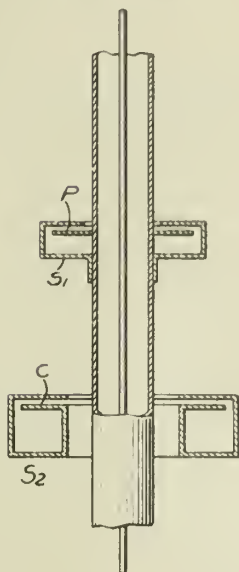
H. J. R. VON BAEYER ET AL  
TRANSMISSION LINE  
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367,936

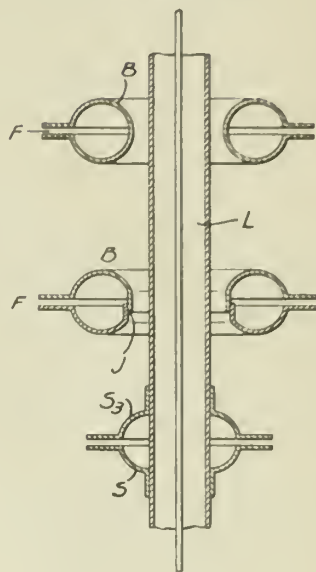
*Fig. 1*



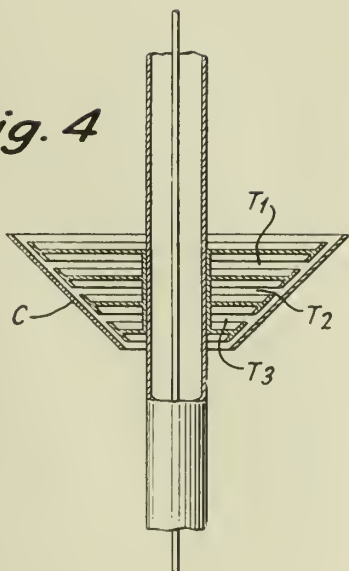
*Fig. 2*



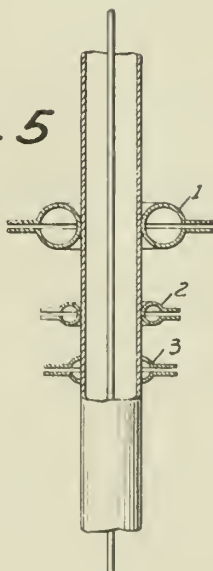
*Fig. 3*



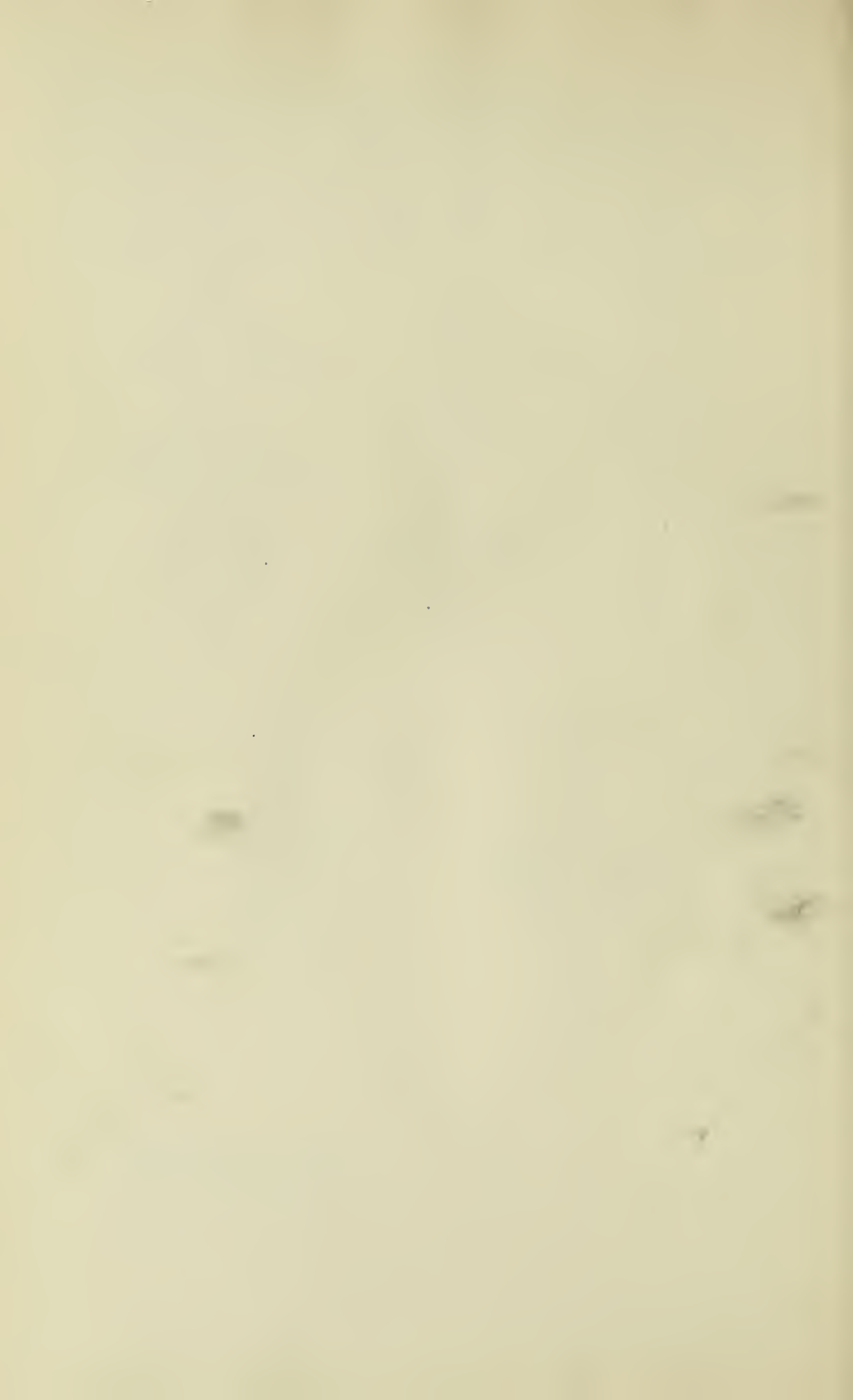
*Fig. 4*



*Fig. 5*



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# ALIEN PROPERTY CUSTODIAN

## ELECTRONIC WATER PURIFIER FOR AVOIDING INCRUSTATIONS

Guglielmo Ciccotti, Rome, Italy; vested in the  
Alien Property Custodian

Application filed November 30, 1940

The invention relates to an electronic water purifier for avoiding incrustations, and is based on the observation that the water when treated with said purifier acquires the important property of not forming any incrustations because of the transformation of some of the salt's physical characteristics, so that when they are subjected to a high temperature they will precipitate as a non compact slime which it is easy to eliminate.

In the purifier the water circulates around one or more glass vessels of suitable form provided with electrodes. A sensible vacuum is created in these vessels, a small quantity of neon or of a mixture of other indifferent gases being then introduced into the same.

An embodiment of this idea may be obtained in practice by means of a container connected to earth and furnished with one or more electrode carrier vessels arranged so that the water to be purified circulates in a thin stratum between the vessels and is then subjected to the action of the electrical effluvium effected therein. The tension capable of producing discharge is reduced to about 70-80 volts by using iron electrodes and a filling gas for the tube consisting of a mixture of gas as above. Means for effecting modifications in the features of the water are thus available through an apparatus connected to the common electrical distribution net-work.

Preferably the operation of the purifier according to the invention requires only one pole of the current to be joined to the electrode, thus the electrical discharge must take place through the liquid stratum enveloping the electrode carrier tube. However, tubes carrying two electrodes may be also used with satisfactory results.

The annexed drawing illustrates two embodiments of the invention.

Fig. 1 shows a longitudinal section of the purifier.

Fig. 2 is a cross section of the same.

Fig. 3 is a longitudinal section of a second embodiment of the invention.

Fig. 4 is a cross section of Fig. 3 according to line III-III.

According to the drawing the illustrated ap-

paratus comprises a cylindrical container 1 provided with two connecting parts 2 and 3 for inlet and outlet of water. Electrode carrier tubes 4 are arranged inside said container and their position is chosen, as aforesaid, so that the water to be purified may circulate in a thin stratum between them. In the embodiment according to Figs. 1 and 2, said tubes are arranged in series of four and crossways with their glass bulbs facing the center of the container as may be clearly seen in Fig. 2.

The electrical current passes through the connection 5 and metal ring 6 placed at one end of container 1. Longitudinal conductors 7 run from said ring, tubes 4 being mounted on said conductors through insulating plates 8.

The earth connection is effected by the mass of water. Inspection glasses 9 are arranged at the ends of container 1.

The electrical effluvium effecting the above mentioned results is obtained by causing the water to be purified to cross container 1 and by applying the necessary tension to connection 5.

In another embodiment of the invention the series of four or more tubes are replaced by an equal number of tubes 12 arranged longitudinally throughout the whole length of container 10 (see Figs. 3 and 4). A conductor consisting of pivot 24 provided with a head 26 having flat surfaces 25 is screwed by screws 23 to cover 18 of container 10. The inside part 22 of the pivot is connected to plate 21 which carries the tension to cylindrical electrodes 13 contained in tube 12 by connections 20. The tubes are mounted on the end of disc 15 provided with cap 14 and inserted in the middle and at the end of bored plates 11. Disc 15 and plates 11 are connected by pivots 35, nuts 36 and tube 37. Cover 18, whose cavity 19 contains plate 21 and contacts 20, is connected to container 10 by joint 17 enveloping edge 16 of container 10. It also carries screw 27 and nut 28 for the earth connection of the container.

Flanges 33 and 34 of container 10 serves to introduce the water and plug 29 screwed into collar 30 effects the discharge of the container.

GUGLIELMO CICCOTTI.



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BY A. P. C.

G. CICCOTTI  
ELECTRONIC WATER PURIFIER FOR  
AVOIDING INCRUSTATIONS  
Filed Nov. 30, 1940

Serial No.  
368,084

Fig. 1

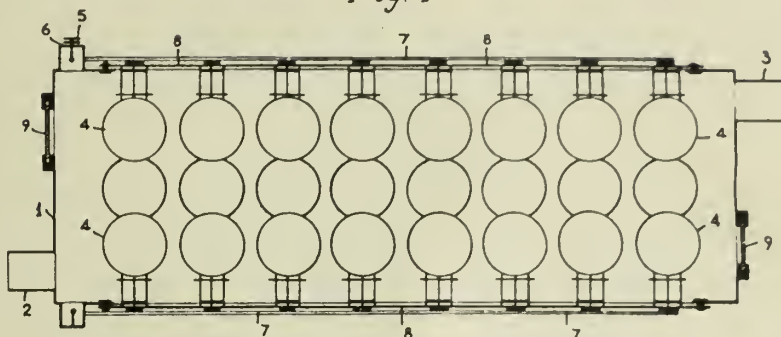


Fig. 3

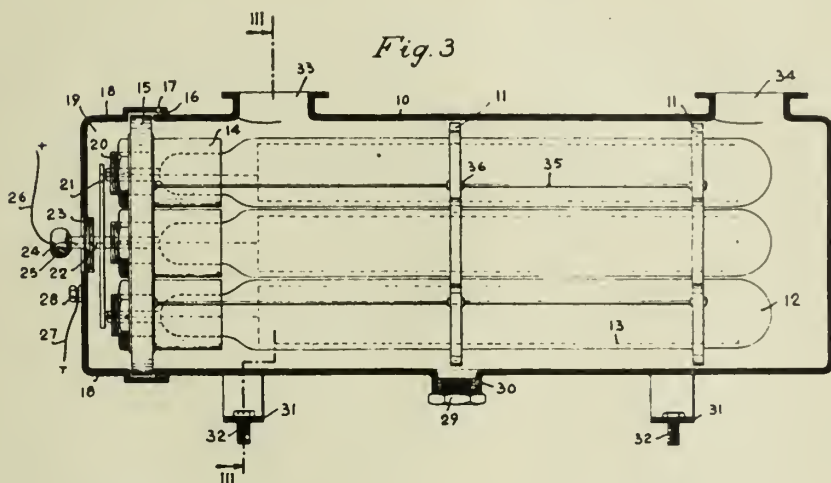


Fig. 2

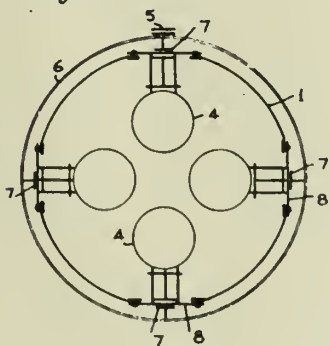
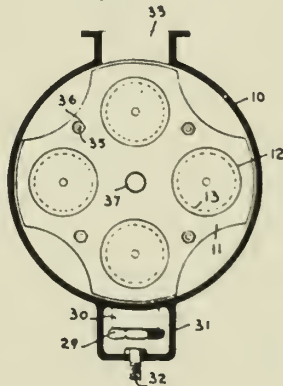


Fig. 4



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ALIEN PROPERTY CUSTODIAN

SHOCK ABSORPTION FOR MOTOR CARS  
WITH WHEELS SUSPENDED TO TRACK  
ALTERING SWINGING HALF-AXLES

Béla Barényi, Boblingen, Germany; vested in the  
Alien Property Custodian

Application filed December 3, 1940

The invention relates to a shock absorption for motor cars with wheels suspended to track altering swinging half-axes, for instance driven rear wheels, and its purpose is a good absorption of the shocks proceeding from the road, and an adaptation of the wheels to the track alterations occurring with the resilience. For this purpose the whcls are suspended to the vehicle frame-work or top (which means either the vehicle frame, or for instance a self contained body) substantially in such a way that each wheel may execute an up and down motion with respect to the vehicle top, doing simultaneously with the up-motion a motion to the rear and a swinging motion around a vertical axis, towards the outside. Specially for this purpose a journalling of the wheels on such swinging half-axes or so called pendulum half-axes is provided that swing together with the wheels as one unit around a joint at the vehicle top, or parts connected to it, so that it immediately takes part of every motion of the swinging half-axe. In order to produce the effect according to the invention, such pendulum half-axes are jointed to the vehicle top preferably by means of joints the turning axes of which, around which the pendulum half axes swing, are inclined backward to the road, the angle of inclination to a horizontal plane being preferably 5 to 30 degrees.

By the invention the following advantages will be obtained:

If one of the wheels strikes an elevation of the road attempting to lift the wheel, and if the shock strikes the circumference of the wheel at a place before its central transverse plane, besides a vertical component of force, a more or less smaller horizontal component of force is produced in backward direction. The resulting force therefore acts under an angle forming according to the condition of the road an angle of 5 to 30° with the vertical.

The wheel being able to execute besides a resilience towards above, simultaneously a backward component of motion, also the horizontal shocks are wholly or at least partially absorbed. Most favorable herewith is a resilience of the wheel in the direction of the resulting force.

Furthermore by means of the invention the advantage is obtained that the wheel adjusts itself somewhat slanting towards the outside from its position in the driving direction, according to the outward slewing motion occurring with the resilience. It is well known that with swinging half axes, specially with pendulum half axes the track of the whcls becomes substan-

tially wider with the resilience of one or of both whcls. Lateral transverse motions of the wheels are produced, the consequence of which being an increased wear of the tires. Supposing the swinging half axes are supplied with the usual horizontal joints, the contact-line of the wheel with the road is displaced in parallel with respect to the central longitudinal plane of the vehicle.

The wheel executing according to the invention simultaneously a slewing motion around a vertical axis towards the outside the wear of the wheels may be substantially diminished, as in consequence of the slanting position of the wheel towards the outside occurring herewith, the wheel rolls into the wider track, so that the so called erasing or wearing of the wheels, when passing from the smaller into the wider track, is wholly or at least partially avoided.

By the slanting position of the joints in which the pendulum half axes are suspended, the above mentioned effect may be obtained in a most simple way.

In the drawing one type of the invention is shown diagrammatically by way of example:

Fig. 1 shows the side view of a driven rear axle.

Fig. 2 shows a plan view of the journalling and the drive of the pendulum half axes in the plane of swinging axle joints.

Fig. 3 is a diagrammatical view of a swinging half axle arranged according to the invention.

Fig. 4 is a plan view of this swinging half axle, and

Figs. 5 and 6 show two types with a somewhat altered drive.

In the drawings *a* are the rear wheels, *b* the axle or differential gear casing to which at both sides of the central longitudinal plane of the vehicle by means of the pins *c* the pendulum half axes *d* are jointed. The drive ensues through a cardan shaft *e* coming for instance from a motor in the front, driving through the axle gear *f*, containing eventually a differential gear, and through the cardan shaft *g* the axle shafts *h* journaled in the half axes *d*. The cardan joints *g* are arranged here within the axis *i* of the joints *c*.

As will be evident from the illustrations this axis *i* of the joints *c* is inclined under an angle  $\alpha$  to the horizontal or to the usually horizontal cardan shaft *e*, the angle  $\alpha$  being substantially so chosen that the axis *i* around which the pendulum half axes swing, extend in a direction perpendicular to the direction of the shocks imparted to the wheel by the road.

With the type shown by way of example in Figs. 1 and 2 the center of the wheel or the joints *g* respectively are lying in the same height as the cardan shaft *e*. For the axle gear in this case a bevel gear is provided. With the types shown in the Figures 5 and 6 with which the wheel-centers or the joints are arranged above or below the cardan shaft *e*, the drive of the half axles may be effected by means of worm wheels or a worm gear or the like. The shock absorption of the half axles against the frame may be done in any desired way, for instance by means of helical springs, laminated or torsional springs which may be arranged for instance in the axis of the joints *c*. With the type according to Figs. 1 and 2 helical springs *o* are provided for the shock absorption, the axis of action of which is lying in a slanting swinging plane of the half axles.

The manner of action of the arrangement according to the invention is the following:

When the wheel strikes an elevation on the

road, as shown in Figs. 1 and 3, the wheel swings around the axis *i* of the joint *c* upward (see Figs. 1 and 3). At the same time the wheel executes a motion-component backward (see Figs. 1 and 4) so that also the shocks acting opposite to the driving direction will be absorbed. The new position of the wheel is indicated by dotted lines at *a'*.

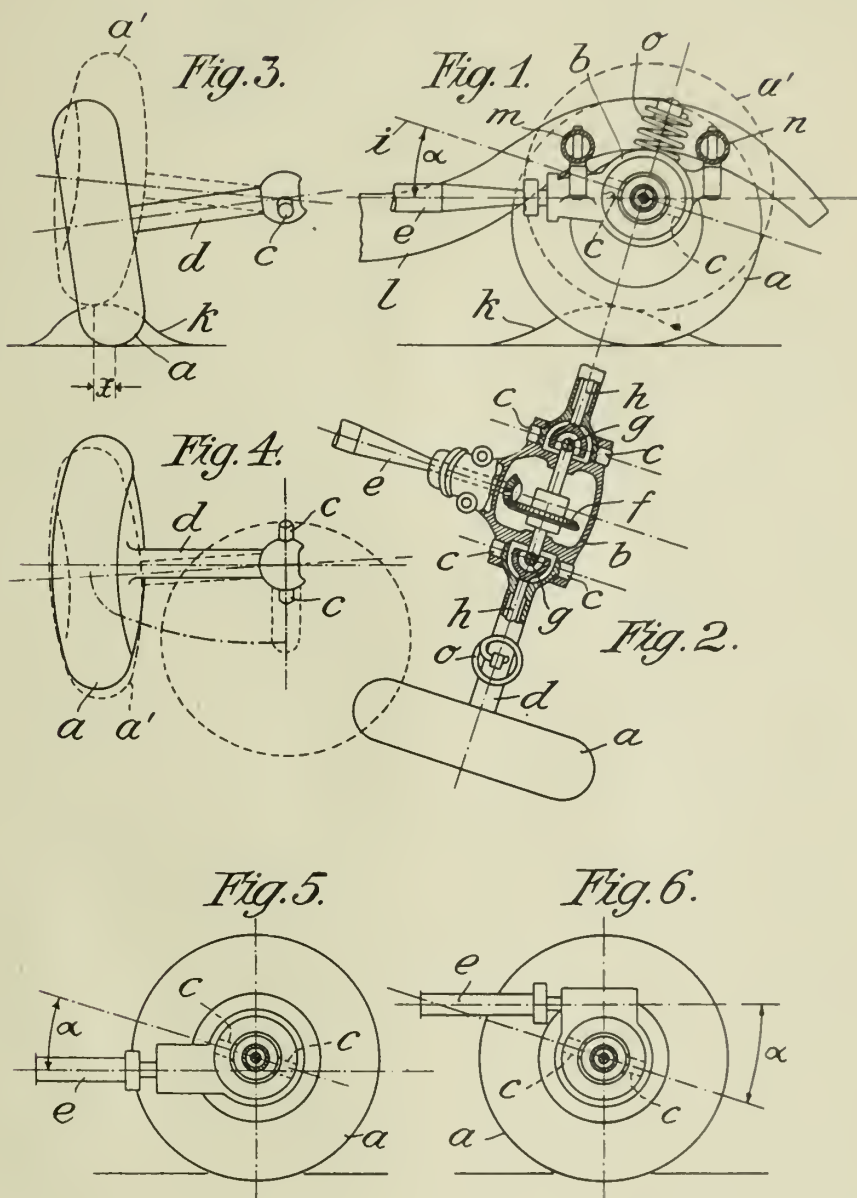
As shown in Fig. 3, with this resilience the track of the rear wheel is widened by the amount *x*. As however, as evident specially from the Figures 3 and 4, simultaneously the wheel takes a slanting position when passing from the position *a* to the position *a'*, also in consequence of the inclination of the turning axis *i*, the wheel may roll from the narrow into the wider track without or substantially without lateral erasing or wearing. As in these moments in consequence of the action of the masses a strong wheel-pressure is produced, by these means a substantial diminishing of the load and a saving in tires is effected.

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SHOCK ABSORPTION FOR MOTOR CARS WITH  
WHEELS SUSPENDED TO TRACK ALTERING  
SWINGING HALF-AXLES  
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# ALIEN PROPERTY CUSTODIAN

## DRIVE OF LOADING BLOWERS, PARTICULARLY LOADING BLOWERS FOR AIRCRAFT MOTORS

Fritz Nallinger, Stuttgart, Germany; vested in  
the Alien Property Custodian

Application filed December 5, 1940

In the application Ser. No. 196,718 filed March 18, 1938 a device for connecting and disconnecting liquid or hydraulic clutches or couplings is described the essential feature of invention of which consists in the following:

Internal combustion engines at times must operate with and at other times without a blower. These different conditions of service require a selective disconnection and connection of the blowers. The control of the blowers is effected by clutches or couplings of the energetic type, for instance liquid or hydraulic couplings or clutches which, according to requirements, are differently filled. The peculiarity of these clutches or couplings, however, results in this that with couplings or clutches, completely emptied from liquid, a substantial drive of the blower is effected by the air whirlings alone. In the clutch or coupling considerable heat is produced and the blower not required to operate is rotated with a relatively high number of revolutions. To obviate this drawback, a mechanical clutch, in the present case a claw clutch or a dog coupling, is provided between the driving shaft and the coupling or clutch driving the blower. To be able to connect the blower in an operating machine, the driven shaft must be synchronized, i. e. the number of revolutions of the driven shaft is to be brought to that of the driving shaft. This is effected in a well known manner by bringing the number of revolutions of the driven portion of the liquid or hydraulic coupling or clutch to that of the driving shaft by means of a synchronizing coupling, for instance a friction clutch. If both numbers of revolutions are equal, then the claw clutch may be engaged and thereafter the blower may be controlled in the desired manner by filling the liquid or hydraulic coupling or clutch. With the described arrangement it is of no importance, whether the individual members are arranged in the succession driving shaft—claw coupling with synchronizing device—liquid coupling—blower, or driving shaft, liquid coupling—claw coupling with synchronizing device—blower.

The object of the former, above described application provides a claw clutch as additional coupling and it has been found that with filled liquid or hydraulic clutch the drive is somewhat

too stiff the prevent hard shocks or blows due to occurring torsional vibrations.

The present invention obviates this drawback and consists in providing in the case of couplings of the energetic type, for instance electric couplings and preferably hydraulic couplings, a friction clutch, for instance a multiple disc clutch, or a cone clutch instead of a claw clutch. This may be provided in any suitable spot of the transmission, preferably between the driving shaft and the hydraulic clutch.

In the accompanying drawing, one construction according to the invention is shown by way of example and diagrammatically in connection with the drive of an air propeller provided with a loading blower driven by a liquid or hydraulic clutch.

As may be gathered from the drawing, in the construction shown by way of example the motor 1 drives an air propeller 3 by means of a shaft 2. Gear wheels 4, 5 forming a gearing up are provided on the shaft of the air propeller, which drives a loading blower 8 for the motor 1 by way of a multiple disc clutch 6 and a hydraulic clutch 7. The multiple disc clutch 6 may be disengaged and engaged by a control fork 9. The slip of the coupling is controlled by a variation of its filling of the coupling. The coupling liquid is admitted by the pipe 10 and discharged again by the pipe 11. To control the filling the supply pipe 10 is provided, in a manner known per se, with a stop valve not shown in the drawing which allows passage of the liquid through the pipes 10 in the same proportion as it closes the passage through a by-pipe connected to the pressure side of a supply pump and vice versa.

The operation and working according to the invention may easily be seen from the drawing. To start the blower, preferably first the multiple disc clutch 6 is slowly engaged. Simultaneously or immediately afterwards the liquid or hydraulic clutch is, for instance by opening the stop valve, filled with liquid until the blower operates with the highest number of revolutions at maximum output. To disconnect the blower, first the hydraulic clutch is emptied or discharged and thereupon the multiple disc clutch is disengaged.

The invention is especially adapted for use in aircraft motors.

FRITZ NALLINGER.



PUBLISHED

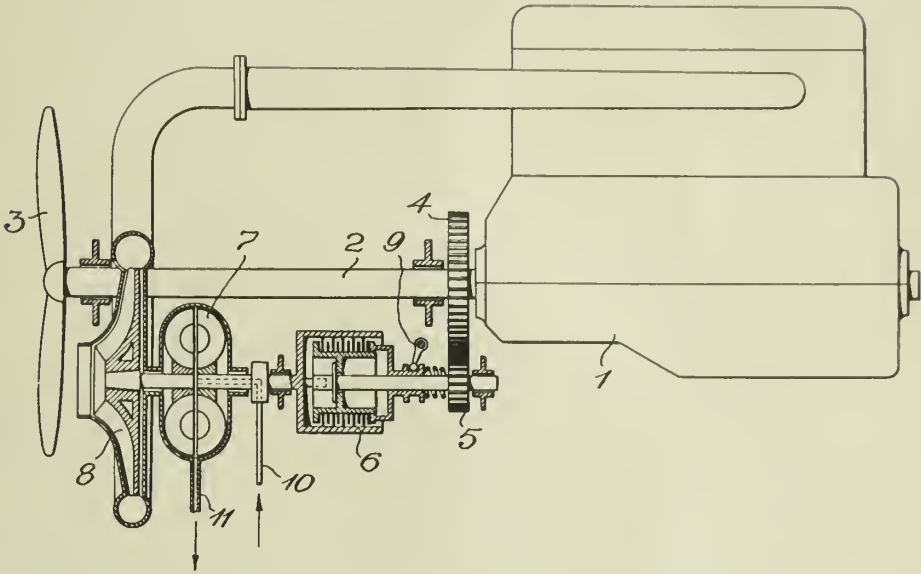
MAY 18, 1943.

BY A. P. C.

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DRIVE OF LOADING BLOWERS, PARTICULARLY  
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